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The Master Mechanic of the Future —and His Job

IF ELECTRIC railways are to give the public the attractive transportation service that will get business under modern competitive conditions, they must have good, well-maintained rolling stock. This is axiomatic, you say? Maybe so, but that does not mean that the fact is fully appreciated in practice. Just as important as buying good cars is having the right kind of men in the mechanical department.

The department that is responsible for the quality and condition of cars is extremely important. These are the tools of service. They must be good. To keep them so requires brains and skill of high order. But in reality the mechanical department, speaking broadly, is not given the executive consideration that its essential character warrants. The head of the department is not chosen with the care, nor paid the salary, that will insure the right caliber of master mechanic or, more properly, superintendent of equipment.

One of the prime considerations is to get a man who will be bigger than his job. He should be one who will not be satisfied merely to keep the equipment at some previously determined standard of repair, but will furnish the leading thought on the whole subject of rolling stock. To the extent to which he is supported he will insure the use of the most appropriate cars that the art affords.

That the situation thus pictured is worthy of attention is indicated by the statement to the writer, by the manager of an important railway, that the place of the master mechanic is one of the most difficult to fill at the salary that can be paid. This indicates that the supply of well-qualified men is not sufficient, or that the salaries offered are not attractive, or both. Another critic of the present situation complains that as compared with manufacturing methods electric railway shop practice is many years behind.

If a given railway is a back number, and is sooner or later to be replaced by other means of getting about, it does not matter much what is done in the shops or elsewhere. But if it has a definite place in the local transportation field, then it is high time to encourage the high-grade men now in the mechanical department and to lay plans to improve future quality by bringing in men who are worthy of training for high places in the department. In fact, the quality of maintenance work is one of the important factors that will determine whether or not some smaller railways are going to continue or go out of business. These men must be practical, of course, but they need vision and executive ability more than manual skill with tools. In fact, a man may be an excellent "master mechanic" without being a mechanic at all, in the usual sense of the term.

In this outline of the duty of the management toward the shops it is not meant to imply that the master mechanic himself is doing all that he could to remedy the situation; but that is another story. Both must realize that it is up to them to improve conditions. Selection of better men and payment of salaries sufficient to get and hold them is the task of the management. If you, Mr. Manager, don't believe it, make a new research on your own property and see if your shop methods meet 1923, rather than 1893, standards. We have a word also for the shop man, but will whisper it to him when you're not around.

Cleanliness of the Shop Premises Is a Profitable Virtue

ONE of the greatest hazards from the fire insurance standpoint in a railway repair shop or carhouse is the refuse which is apt to accumulate in corners, under machinery, between pits and in other out of the way places. There is so much that is inflammable about a car body and in the material, like oil, paint and varnish, used in and about a carhouse and shop that when a fire once gets well started it is apt to spread. Hence an even greater effort should be made to prevent a fire starting than to put it out when it does begin.

Of course, most of the buildings recently erected for the repair and storage of cars have been constructed to reduce fire hazards, but there is far more connected with this object than the form of construction used. Of almost, if not quite, as great importance is the kind of "housekeeping" practiced in the shop or carhouse. In fact, this is one of the major matters considered when fire underwriters establish their premium rates, so that the repair shop or carhouse foreman who looks out for this matter and impresses the need of it upon his men may often be the means of saving a large sum for his company. Here are some of the simple rules that such a foreman can enforce.

He can see that all combustible refuse is put in waste cans and that these are emptied daily, that dirt in general does not collect in obscure places, that men keep their shop clothing in their lockers when they leave for the night and that discarded clothing is taken away, that they do not hang clothing or other things on electric wires or fixtures, that the building wiring in general is maintained in good electrical condition, that material does not lean against it and that the wiring is not in a position where it is subject to mechanical injury, that the drip from oil barrels and oil tanks is caught before it can fall on the floor, that empty oil barrels are promptly removed, and in general that the premises are kept tidy with a place for everything and everything in its place.

There is much, of course, in the way of fire protection which can economically be installed with the expenditure of money, but there are also many things, like those mentioned above, which cost nothing but a little care and consideration, and the returns from this expenditure are enormous.

High Labor Cost Stimulates Development of Maintenance Economics

THERE was a time when much of a mechanic's energy was spent in doing things that required little or no mental effort. This is still true to some extent, but much less than formerly. The improvement is due to the use of good hoisting and transporting machinery; to the routing of work so as to eliminate lost motion; to the application of machine tools properly adapted to the operation to be performed; to the keeping of good cost records; to the exchange of information among railway properties, which results in higher standards of performance; to the wonderful development in the art of reclamation, and, last, but in many ways most important, to the spread of the real educational spirit throughout the shop organization.

The best and therefore most highly paid physician is he who keeps his clients well. By analogy the best master mechanic is the one who keeps cars out of the shop rather than the one who repairs them quickly when they are pulled in. This means two things: First, a thorough knowledge of the causes which make repair work necessary, and, second, the best possible facilities for doing first-class maintenance work. Managers seem to be waking up to the fact that a definite part of their success depends on having a first-class shop, run in accordance with modern methods. Otherwise maintenance costs would be much higher than they are.

It follows, then, that the increasing difficulty which electric railway master mechanics are having in getting reliable craftsmen for the several shop departments is not without compensating advantages. It is forcing attention to shop economics as nothing else could possibly do. In other words, as expert labor is now recognized as a commodity of relatively high unit cost, every effort is being made to utilize it effectively. The result is improvement all along the line. Everything that can be done to substitute machine work for hand work is a matter of great interest. As far as possible manual operations are being confined to special, rather than routine work.

Cultivate the Habit of Observation

THE human mind frequently fails to assimilate things that are seen by the eye. Whether the hour of six is indicated on the face of his watch by a Roman or an Arabic numeral is a question which many a man cannot correctly answer. We often find it extremely difficult to describe objects with which we are familiar from daily observation. There is, of course, a great difference between individuals in this respect; details which make a deep impression upon one man are entirely overlooked by another.

The trainmen of an electric railway can materially assist in the maintenance of equipment by observing and reporting defects. The average motorman or conductor, however, is not as useful in this respect as he might be. A minor defect is often allowed to continue unknown to the mechanical department until it grows into a major defect which cripples the car. Frequently this could be avoided. The time to fix a hot journal, for instance, is when it first begins to squeal, rather than after the waste is on fire and the babbitt melted, but in order to notice such things at the beginning, trainmen must have the habit of observation.

In a general way, it may be said that keenness of observation depends directly upon the interest taken by the individual. An aviator notices the slightest variation from the rhythmic hum of his machine, because his life depends upon it. The driver of an automobile soon notices the slightest knocking of his engine. But the operator of a railway car often goes blithely along heedless of clatter and bang, or a dragging sensation, that ought to tell him there is something wrong.

If the trainmen can be persuaded to watch with a keen eye for the slightest defects in the equipment, to develop good "mechanical sense" so to speak, they can render great assistance to the mechanical department. They are in a better position to observe such things than are the shopmen, and the men themselves, the company and the public will all benefit by catching car ailments at the first indication of trouble.

Increased Life Obtained Justifies Welding of Manganese Steel

MANGANESE steel is used quite generally in special trackwork construction at points where traffic is heavy. At such points frequent relaying or replacement is costly and it is therefore quite essential to prolong the life of the trackwork as much as possible.

Building up and patching manganese special trackwork by welding has been used to a considerable extent for the past ten years. The results obtained are not of a permanent character, but they do prolong the life of the various pieces and so extend the time when entire renewal is necessary. Most track engineers feel that if the life of the trackwork is extended two or three years the expense of welding is justified, and some say that even one year of additional service will justify welding.

The constant pounding produced by the wheels of rolling stock on the manganese frogs at crossings causes low spots. The metal becomes fatigued, and sagging results. The building up of these points and grinding smooth gives a new surface. While not as good as the original, still with proper cohesion of the added metal a surface is obtained that may last for several years.

Manufacturers of special trackwork have argued against such repairs, as they do not produce a permanent remedy, and must be considered as a rather temporary expedient. The objection has been put forward that the physical properties of the manganese are altered by welding, but from the maintenance man's point of view this makes no great practical difference, since if welding repairs were not made the piece would have to be replaced anyway. The steel in close proximity to the weld no doubt is changed in character. General observation, however, indicates that this change is not detrimental, as the manganese parts after welding wear well, and in most cases give from two to five years additional service.

The various methods used have not produced manganese steel of the same character as that used in the original switch or frog. The heat treatment used in the original process cannot be duplicated in welds made in the open under service conditions. The additional service obtained in most cases, however, proves that real economy results from welding, and the increased life obtained is satisfactory.

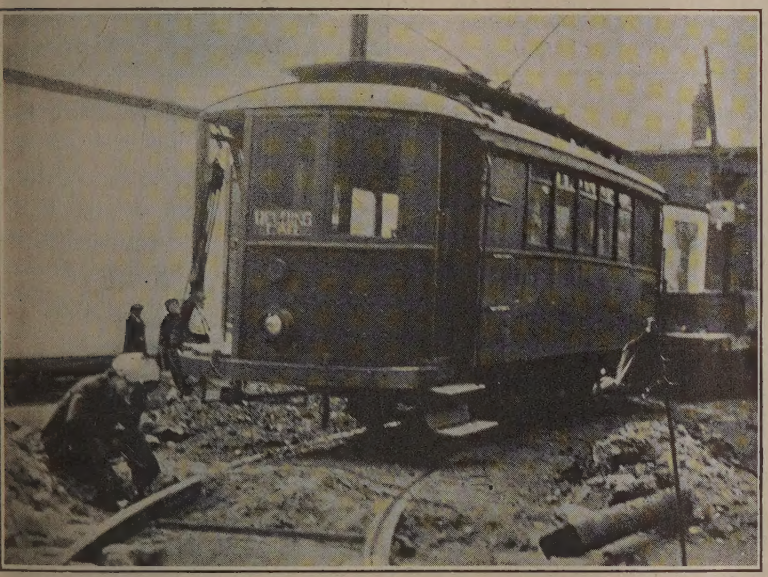
An Electric Welding Car in St. John, N. B.

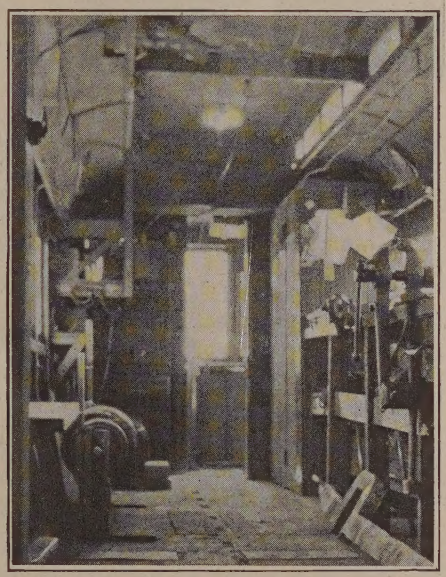
Standard Welding Equipment Has Been Mounted in a Motor Car to Provide a Portable Unit Suitable for Track or Shop Use

By C. L. Boxter
Chief Welder New Brunswick Power Company, St. John, N. B.

IN ST. JOHN, N. B., we began the use of the electric welder in the year 1917. Until last fall the dynamotor used for supplying the welding current was mounted in the original cart, and was used for trackwork almost exclusively, being hauled from one location to another by a team, a slow process when jobs are small and far apart. Due to switchboard and commutation troubles the machine did not render very good service for this work, and it was found unsatisfactory in the shop.

Being confronted with the alternatives of either making this machine operate efficiently or purchasing a new outfit, and desiring better welding facilities at the repair shop, we conceived the idea of changing the design of the machine so that it would be mounted complete in a car, thus providing a portable welding room suitable either for track or shop work. This idea has been worked out very satisfactorily for use on this property.





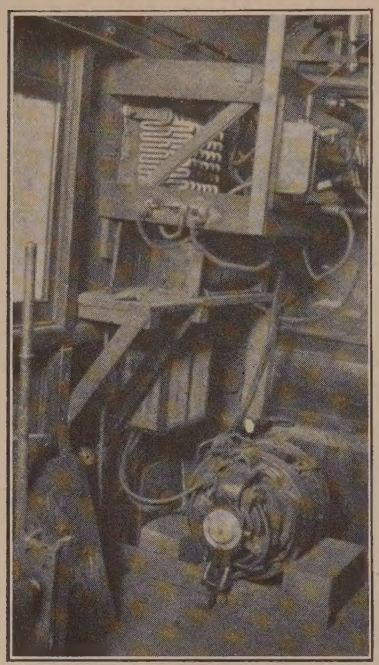
At Left, Welding on Dead Track in Daytime. At Right, Inside View of Car, Showing Armature in Position for Welding

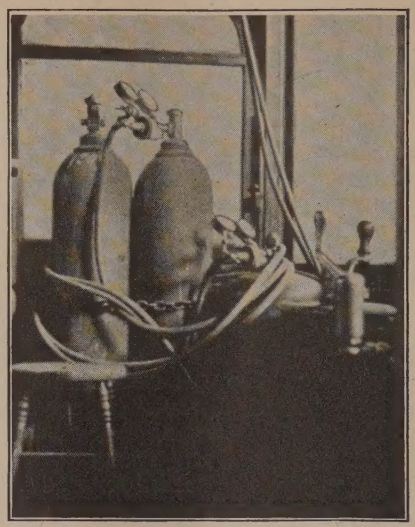
We used an old single-truck car which had originally been an open car. This was sheathed up on the sides and windows were fitted. A bench was built on one side running the entire length of the car except for a space at one end occupied by a supply cupboard and a clothes locker. Spaces were partitioned off beneath the bench for the storage of helmets, welding rods, carbons, and other supplies, and drawers were provided for tools.

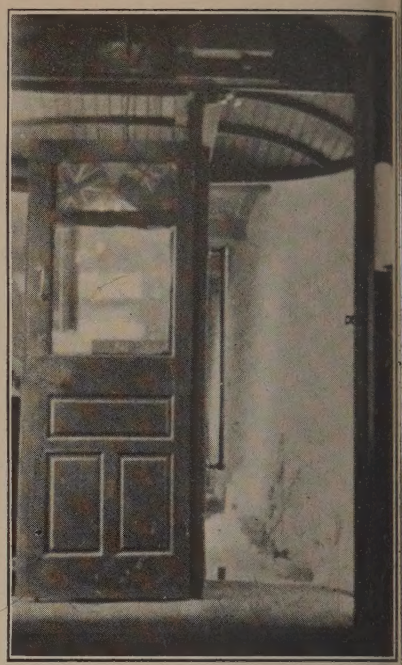
Two cross beams were installed overhead to accommodate a block and tackle, and a small roller dolly was constructed for use in running heavy articles into the car. The front vestibule of the car was completely inclosed, and the rear one inclosed for about two-thirds its width, thus leaving a small open deck over which rails, truck frames and other long articles could be put directly into the car. A davit was installed at the rear of the car body, carrying a hoist, and arranged to swing over the side. Heavy articles are lifted easily and swung inside onto the dolly, on which they are pushed forward to the proper place for welding. Being an open car originally the floor is level from end to end, facilitating this method of loading.

Three steel frames were built, one for axles, one for armatures, and one of adjustable length for smaller shafts. These were all fitted with lathe centers to support the object while being welded, permitting easy turning. All three frames may be removed from the car and stored outside when desired. The frame for supporting armatures is so arranged that it will fall forward with the centers on a level with the shaft of an armature resting on the dolly. The centers are then screwed into place, after which the whole apparatus is easily swung back to the normal position, carrying the armature with it, ready for welding. Axles are placed in their frame by means of a hoist.

The welding machine is mounted on the floor in the front left-hand corner of the car, with a switchboard of our own design mounted above it. Both the motor and the generator circuits are grounded to the car truck, the generator also being grounded to four iron floor plates, one bench plate, and a vise. This is to obviate the use of a ground cable, as the articles being welded make contact through one or another of these devices. In addition to this, floor traps may be lifted and work







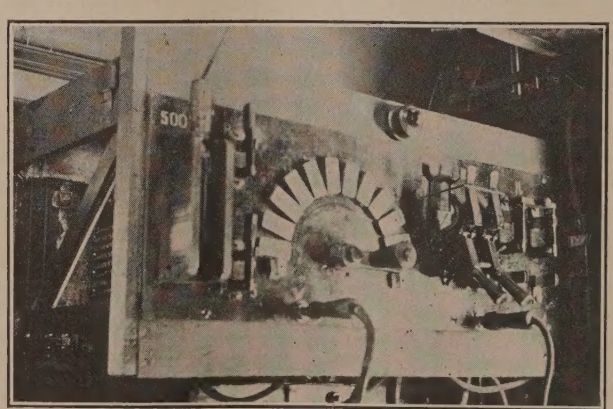
At Left, Welding Unit and Switchboard. In Center, Acetylene Outfit Mounted on Platform. At Right, Door for Allowing Insertion of Long Objects Into Car

lowered through to the track level, grounding against the car axle, if desired. The armature and axle frames, when in use, rest on a floor plate for grounding. A ground cable is provided for use in grounding articles outside the car, and which are not in contact with the track, which of course is in direct connection with the car truck.

A welding cable is carried along the wall on hooks in such a manner that it is convenient for use at any point in the car. Another cable is arranged similarly, to permit changing from metallic to carbon arc without changing the electrode holders. An extra welding cable is kept on the front bulkhead for outside use, this cable being plugged into outside receptacles, of which one is located at each end of the car. These are connected to the machine through a single-pole double-throw switch which permits ready reversal of the polarity.

A "surge control" unit obtained from the manufacturer of the machine, a new bank of grids and a new switchboard were installed, resulting in the perfect operation of the machine. The surge control consists of a bank of resistance connected to the line switch on one side and to the armature on the other. The 500-volt current is taken from the car trolley to a line switch near the ceiling. This switch is opened when the machine is shut down for any length of time or when the car is running. From this switch the current goes to a second line switch on the board, then to the fuse, the surge control, and the machine. A cord connected to this second switch runs through the car in a manner similar to a bell cord, so that the machine may be shut down from any point in the car.

The switchboard is mounted vertically above the dynamotor. It carries the second line switch, two single-pole single-throw switches, one of which parallels five grids and the other six grids in the welding resistance. These are used principally in carbon arc work. A twelve-point rheostat dial is connected with the welding resistance. The starting resistance is controlled by the original breaker switches. These were at first mounted horizontally, and were responsible for part of our trouble. They have been remounted in a vertical position and are now entirely satisfactory. A double-pole double-throw switch controls the stabilizer resistance, increasing or decreasing it, as designed by the manufacturer. The stabilizer itself, together with the welding resistance, is mounted behind the switchboard. The stabilizer is short-circuited by a single-pole single-throw switch on the board, while the carbon arc is in use, the switch being open for metallic arc work. A bell is connected to the breaker switches so as to ring if the breakers open while the machine is in operation. This feature is of use when work is going on outside the car. There are two cable receptacles on the board, one for the welding cable and the other for the ground connections, these cables being reversed to change the polarity of the floor plates.



Close-Up View of Switchboard

An oxyacetylene outfit is carried on the front platform at one side of the controller, where it readily may be removed from the car for use when needed.

We have no car traffic on our lines between the hours of 12:30 and 5:45 a.m. All our work on track is done within these hours, except on dead track under construction and surface work, which occasionally is done during

the daytime. Light is provided by means of a bank of lamps outside the car, and a single-lamp extension cable which may be plugged into an outlet outside of the vestibule. This outlet is connected to a two-way switch which cuts out one inside lamp when the extension is to be used.

The trackwork done consists of joint welding, bonding, some surface work, building up of broken rail heads, repair of special work, and all acetylene work. The car is run to the job, being timed to arrive as soon as the last regular car has passed, and leaves before the first one arrives in the morning. Two men compose the crew, each man being able to handle the machine, the oxyacetylene outfit, and to operate the car. In winter weather they work in turns, one welding outside while the other is warming up. When the oxyacetylene set is being used, the second man does shop welding, thus making a saving of time.

By Working at Night Welder Is Used Twelve to Fourteen Hours Daily

Both men work from 12 o'clock midnight to 6 a.m. on trackwork in the summer, one putting in from three to four hours additional in the morning on shop work, the other spending a like amount of time in the afternoon. This gives us twelve to fourteen hours use of the machine each day. Enough work is available in the winter in the way of handling maintenance and in preparing work for the welder to keep the second man busy, it being necessary at times to stagger their hours in order to obtain a longer day for the machine so as to keep up with the work.

The shop work we do generally consists of truck frames, armature shafts, brake gear, motor cases, gear cases, rebuilding trolley bases, repair of journal boxes, tools of all sorts, automobile parts, power-house work, machine parts, etc., including the welding of brass and cast iron. The acetylene is used almost entirely for preparing for welds and cutting of rails, bolts, rivets and scrap.

Trackwork is performed more efficiently because of the constant trolley voltage available at night and the absence of traffic interruptions. We find that very nearly as much work can be done at night in five or five and one-half hours as can be done in nine hours in the daytime, and what is done is done better. Shop work may be carried on inside the car if trackwork is interrupted by rain, and little time is lost in getting from one job to another, work being done in widely separated places in one night. When necessary, 30-ft. rails may be carried along to the job in the car along with a shop-full of tools, the welding machine, the acetylene outfit and the track gang. Welding is done directly on other cars by spotting the welding car on an adjacent track or the same one, thus obviating dismantling the car for welding. Of course, this can only be done occasionally.

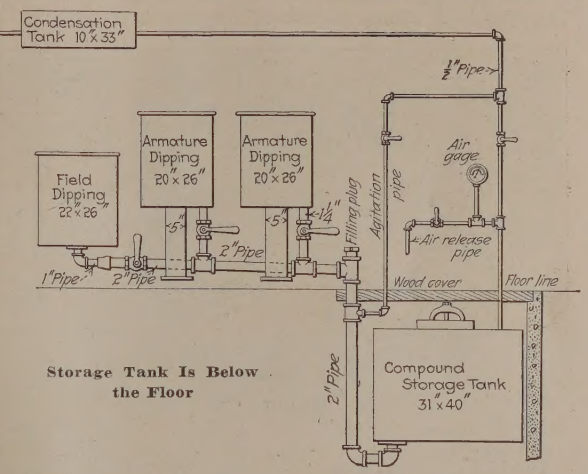
By arranging the welding unit in this form so that it is flexible and mobile we have made it do both for shop and track, thus avoiding the investment in a second unit which probably would lie idle most of the winter. The original outfit was supplied by the Rail Welding & Bonding Company, which also furnished the surge control resistance.

The results obtained in St. John have fully justified the construction of the outfit. Its flexibility permits us to use it for many jobs at widely separated points where welding would not be attempted if the ordinary outfit had to be hauled around.

New Armature Dipping Tanks at Erie Filled by Air Pressure

Apparatus Is So Designed that an Extremely Small Quantity of Compound Is Required—The Fire Hazard Is Reduced and the Speed of Operation Is Increased

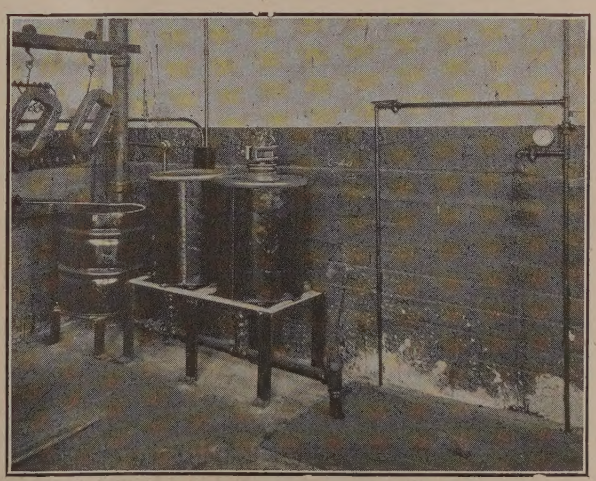
THE installation of a new armature dipping and baking plant has just been completed at the East Twelfth Street shops of the Buffalo & Lake Erie Traction Company. For convenience in handling the varnishing compound and economy in the quantity of compound used, the method followed in these shops is a distinct improvement over common practice. The dipping tanks and the general layout were designed by P. J. Wood, master mechanic of the company, and the ovens are of the standard type manufactured by the Westinghouse Company.



Storage Tank Is Below the Floor

The varnishing compound is kept in a small underground tank of 2-bbl. capacity. Near by are two vertical cylindrical tanks for armature dipping and a rectangular vat for the treatment of field coils. All the dipping tanks have direct pipe connection with the tank of compound, so that filling and emptying is merely a matter of turning a few valves.

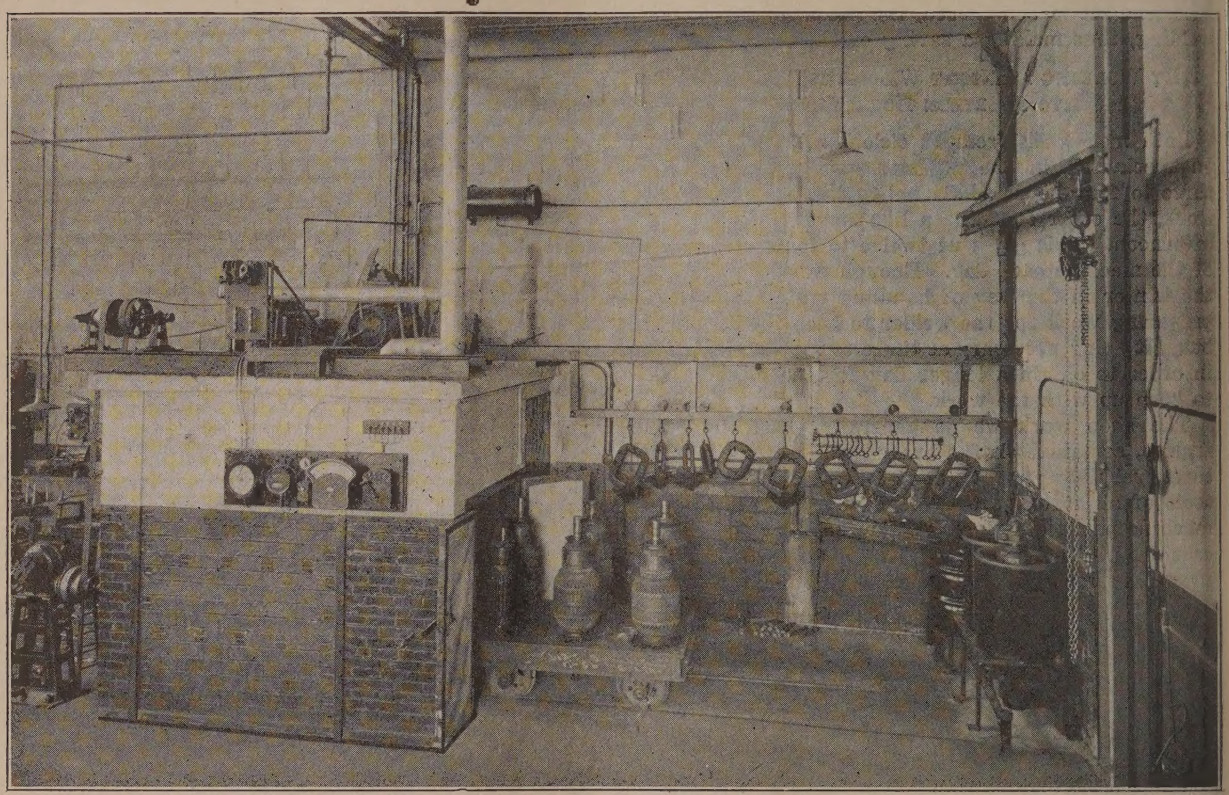
An armature is placed with axis vertical and commutator end up in the cylindrical tank, which is 16 in.



The Compound Is Forced Up from a Tank Below the Floor by Air Pressure

deep and has a diameter of 20 in. The pinion end extends downward into an opening especially provided for it, and a felt gasket on which the hood rests prevents varnish from running down onto the pinion.

The compound is admitted to the body of the tank at the bottom by an inlet pipe which comes from the main supply. Varnish is allowed to flow in until the level in the dipping tank has risen high enough to cover all parts to be treated, but the valve is closed before the varnish reaches the commutator. It requires only a small quantity of compound completely to fill the dipping tank because the armature itself occupies the greater part of the space. Thus economy is achieved in the use of varnish, the fire hazard is reduced, and the speed of the operation is improved.



Field Coils Are Carried by Monorail Into the Baking Oven

The supply tank has been placed underground, and compressed air is used to force the varnish through the pipes. The main air pressure, controlled by a convenient valve, is admitted to the underground tank through the top at one end. At the bottom at the opposite end is an outlet pipe which connects with each of the dipping tanks. When the valve is opened, admitting air pressure into the supply tank, the compound is forced out at the bottom and up in the inlet pipes of the various dipping tanks. By manipulation of individual valves as much varnish as desired can be admitted to each tank.

After the filling process is ended, the main air pressure is shut off from the supply tank, and when it is eventually desired to empty a dipping tank, the air vent of the supply tank is opened and the compound flows back again, until the dipping tank has been drained. This air vent serves another useful purpose also, as it is sometimes desired to agitate the varnish stored in the supply tank. To do this the vent is opened and air is admitted through a special agitator pipe leading to the bottom of the tank. The air introduced here rises through the varnish and escapes through the vent, stirring up the varnish.

The comparatively small amount of compound required completely to surround an armature in the dipping tank makes possible an unusual heating method, in which the armatures themselves are heated, instead of the varnish, as is usually the case. A short, straight section of narrow-gage track connects the dipping tanks with the baking oven. On this track is a little car arranged to hold six armatures. The car is loaded and pushed into the oven, where its load is thoroughly heated. Then it is pulled back to a position where a jib crane can lift out armatures and put them in the dipping tanks. A hot armature is placed in each tank, which is immediately filled with varnish.

The quantity of heat absorbed by the armature while in the baking oven is more than sufficient to raise the temperature of the surrounding varnish to the required degree. Armatures are allowed to remain in the dipping tanks until all bubbling has ceased, which usually takes about ten minutes. The first two are then removed from the tanks and returned to their places on the little car. Two more pairs are treated in the same way, and then the car is pushed back into the oven while the armatures are baked.

A rectangular dipping tank for field coils is located beside the two cylindrical tanks and is filled and emptied in the same manner. For their transportation to and from the oven a continuous overhead monorail track has been constructed. The field coils are suspended from small trolleys which are pushed along the monorail into the oven, around a loop inside, and out again when the baking has been completed.

Rail Joint Tests on the Detroit Municipal Railway

The Department of Street Railways in Detroit Has Conducted an Extended Series of Tests on Seam-Welded Rail Joints—Full Particulars Are Given, with Comments on a Large Number of Cast-Welded Joints Removed During Track Rehabilitation

DURING the last two years the electrical department of the Detroit municipal railway, under the direction of H. M. Gould, electrical engineer, has made an extensive study of the strength of seam-welded rail joints and incidentally of the mechanical and chemical structure of cast-welded joints. The investigation of the qualities of seam-welded joints was conducted because this joint had been adopted as standard for all new work by the Department of Street Railways of the city of Detroit. The study of the cast-welded joint was made because a large number of these joints were formerly used on the Detroit system and are being taken up as the city track is being rehabilitated or renewed by the Department of Street Railways.

These Types of Failure Are Common in the Cast-Welded Joints Removed from Track in Detroit

The installation of rail joints in Detroit has been assigned to the electrical department partly because of the important function which the joint has in the return circuit and partly because the problems of electrical welding would naturally be assigned to this department. The study of the cast-welded joints removed was undertaken by this department as a matter of scientific interest.

Of all the cities which employed cast welding for rail joints when that method was followed, the process was probably most extensively used in Detroit, Minneapolis, Milwaukee and Brooklyn. It was thought, therefore, that the track rehabilitation at Detroit afforded an excellent opportunity for a comprehensive inventory of the cast-welding process for rail joints, at least as employed in that city.

Tests with Electrically Welded Joints

The standard type of track construction in Detroit under the present management, as described in the issue of this paper for July 23, 1921, is monolithic, except at special trackwork. The present standard for construction calls for International twin steel ties 5 ft. 6 in. average centers; the standard A.R.A. Type A 100-lb. plain girder rail; seam-welded joints; and the base of the rail welded to the tie at every joint and at every third intervening tie. The first track laid, for about 60 miles, was with 91-lb. 7-in. T-rail. The Street Railway Department knew what might be expected from concrete, rails and ties, but the quality of electrically welded joints was largely unknown. Hence, beginning about October, 1920, when an extensive construction and rehabilitation program was being planned, a series of tests on rail joints, seam-welded in different ways, was begun. The actual tests were made at the Perry Testing Laboratory in Detroit, under the direction of the electrical department.

In the various forms of joints tested, with two exceptions, the metallic arc was used. One reason for this was that at the time the trackwork in Detroit was done, practically all of the joint welding was on new tracks where no trolley current was available. The metallic arc requires about 150 amp. at 30 volts, and the carbon arc approximately 300 amp. at 60 volts, and as at that time there were no welding machines on the market that would take care of two carbon arcs, the metallic arc was adopted. The welder used was the two-arc gasoline-driven welding machine of the Wilson Welder & Metals Company, mounted on a track lorry. Altogether, tests have been made on forty different types of welded joints. As the tests were begun with the 7-in. 91-lb. rail they were continued with that rail to have the results comparable, though a change has been made in the company's standard as described. The essential data obtained from each test are given in the accompanying drawings. The following comments give further particulars of the tests and present the opinion of the electrical department on the results shown.

Particulars of Individual Tests

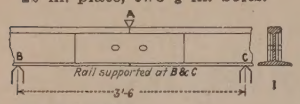
Case 1 was a joint set up with 20-in. plates and two ⅞-in. bolts, but not welded. This test was made to determine the strength given to the joint by two bolts without any welding.

Case 2 was a joint set up in a similar manner with four bolts and no welding. The results of Cases 1 and 2 were about of the same order.

Case 3 was seam welded for the full length of the

Case 1
No Welding

91 lb. 7 in. tee rail, ¾ in. x 20 in. plate, two ⅞ in. bolts.

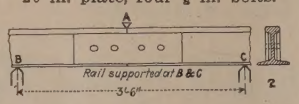


Load Applied At "A"	Deflection in in.
25,000 lb.	.0938
40,000 lb.	.2187
50,000 lb.	.4375
75,000 lb.	1.3437
90,000 lb.	2.2187
99,200 lb.	See below

At 99,200 lb. test was discontinued on account of bottom of rail touching base of testing machine. Small crack in plate near bolt hole. Plate and rail badly bent, bolt head slightly sheared.

Case 2
No Welding

91 lb. 7 in. tee rail, ¾ in. x 20 in. plate, four ⅞ in. bolts.

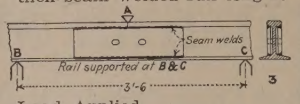


Load Applied At "A"	Deflection in. in.
25,000 lb.	.0625
40,000 lb.	.1250
50,000 lb.	.2188
75,000 lb.	1.3125
90,000 lb.	2.4063
96,350 lb.	See below

At 96,350 lb. test was discontinued on account of bottom of rail touching base of testing machine. Small crack in plate near bolt hole. Plate and rail badly bent. Bolts O.K.

Case 3
Electric Arc Weld

91 lb. 7 in. tee rail, ¾ in. x 20 in. plate, two ⅞ in. bolts upper and lower edges of plate were scarfed to 45 deg. and then seam welded full length.

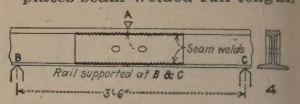


Load Applied At "A"	Deflection in in.
70,000 lb.	.4375
75,000 lb.	.50

Plates cracked from bottom scarfing. Plates split entirely across at 75,000 lb.

Case 4
Electric Arc Weld

91 lb. 7 in. tee rail, ¾ in. x 20 in. plate, two ⅞ in. bolts, plates seam welded full length.

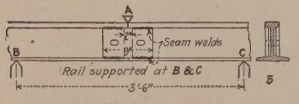


Load Applied At "A"	Deflection in in.
50,000 lb.	.125
60,000 lb.	.187
70,000 lb.	.250
75,000 lb.	.281
80,000 lb.	.312
90,000 lb.	.437
100,000 lb.	.499
110,000 lb.	.562

One plate cracked all the way across at 110,000 lb.; both plates split on continuing load. Probable elastic limit of ¾ in. plates, 78,650 lb.

Case 5
Electric Arc Weld

91 lb. 7 in. tee rail, ¾ in x 9 in. plate, two ⅞ in. bolts, plates seam welded full length except for 2 in. lap at joint.

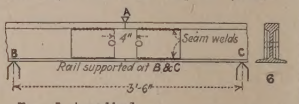


Load Applied At "A"	Deflection in in.
25,000 lb.	.3063
40,850 lb.	3.000

At 35,900 lb. plate distorted and pulled away from welds on ends. At 40,850 lb. weld failed completely and rails spread about 2½ in. at bottom.

Case 6
Electric Arc Weld

91 lb. 7 in. tee rail, ¾ in. x 20 in. plate, two ⅞ in. bolts, plates seam welded full length except for 4 in. lap at joint.

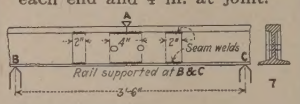


Load Applied At "A"	Deflection in in.
25,000 lb.	.125
50,000 lb.	.375
85,330 lb.	See below

Plate broke at 85,330 lb. test continued until second plate broke.

Case 7
Electric Arc Weld

91 lb. 7 in. tee rail, ¾ in. x 20 in. plate, two ⅞ in. bolts, plates seam welded 2 in. at each end and 4 in. at joint.

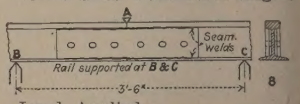


Load Applied At "A"	Deflection in in.
40,000 lb.	.0625
50,000 lb.	.1250
60,000 lb.	.2187
75,000 lb.	.3437
97,750 lb.	See below

Both plates cracked at 97,750 lb. Bottom center welds sheared off. One end weld on each fish plate intact; all others started to shear off. All welds stood up in good shape until plate broke.

Case 8
Electric Arc Weld

91 lb. 7 in. tee rail, 26 in. Cleveland plate, six ⅞ in. bolts. Plates seam welded full length.

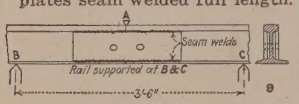


Load Applied At "A"	Deflection in in.
40,000 lb.	.1250
50,000 lb.	.2812
60,000 lb.	.3437
75,000 lb.	.4687
90,000 lb.	.6562
109,000 lb.	See below

Plates cracked at 109,000 lb. and broke at 116,250 lb. Welds on both plates, top and bottom, sheared off about half way back from joint, due to distortion of plates. Welds showed no signs of shearing until plates broke.

Case 9
Electric Arc Weld

91 lb. 7 in. tee rail, ¾ in. x 20 in. plate, two ⅞ in. bolts, plates seam welded full length.

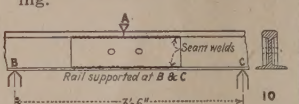


Load Applied At "A"	Deflection in in.
25,000 lb.	.0625
40,000 lb.	.0937
50,000 lb.	.2812
75,000 lb.	.7500
90,000 lb.	.9688
114,350 lb.	See below

Both plates cracked at 114,350 lb., bottom welds on both sides sheared off about one-third of way from joint. Top welds let go near joint. Welds held well until plates broke.

Case 10
Acetylene Weld

91 lb. 7 in. tee rail, ¾ in. x 20 in. plate, two ⅞ in. bolts, plates seam welded full length acetylene weld made by Oxweld Acetylene Co. of Detroit. Rails preheated before welding.

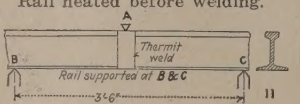


Load Applied At "A"	Deflection in in.
70,000 lb.	.187
75,000 lb.	.219
80,000 lb.	.266
90,000 lb.	.296
117,000 lb.	See below

Probable yield point 76,870 lb. Plate broke at 117,000 lb. weld intact.

Case 11
Thermit Weld

91 lb. 7 in. tee rail, no. plate. Thermit weld made by Metal & Thermit Corporation Rail heated before welding.

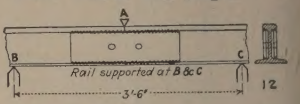


Load Applied At "A"	Deflection in in.
75,000 lb.	.125
80,000 lb.	.125
90,000 lb.	.141
100,000 lb.	.157
110,000 lb.	.188
120,000 lb.	.203
130,000 lb.	.250

Probable yield point 127,500 lb. Ultimate strength, 203,500 lb. The "Center Punch Marks" on weld metal and rail metal indicated that the yield was taking place in the weld metal. The failure seemingly took place outside the weld.

Case 12
Electric Arc Weld

91 lb. 7 in. tee rail, ¾ in. x 20 in. plate, two ⅞ in. bolts, plates scarfed on upper and lower edges at 55 deg. angle scarfing ½ in. wide. Plates seam welded full length.

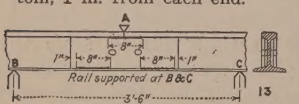


Load Applied At "A"	Deflection in in.
25,000 lb.	.023
50,000 lb.	.091
60,000 lb.	.132
70,000 lb.	.262
80,000 lb.	.406
90,000 lb.	.953
93,630 lb.	1.661
95,580 lb.	Complete failure

Weld started to break at 80,000 lb. Rail broke through flange and web at 90,000 lb. Rail showed brittle structure.

Case 13
Electric Arc Weld

91 lb. 7 in. tee rail, ¾ in. x 20 in. plate two ⅞ in. bolts, plates seam welded 8 in. on top at center and 8 in. on bottom, 1 in. from each end.

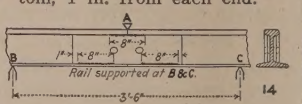


Load Applied At "A"	Deflection in in.
25,000 lb.	.053
50,000 lb.	.132
60,000 lb.	.215
70,000 lb.	.346
80,000 lb.	.553
90,000 lb.	.909
96,850 lb.	1.062
98,156 lb.	Complete failure

Welds started to break on top and bottom at 90,000 lb. Fish plates broke at 92,000 lb.

Case 14
Electric Arc Weld

91 lb. 7 in. tee rail, ¾ in x 20 in. plate, two ⅞ in. bolts, plates seam welded 8 in. on top at center and 8 in. on bottom, 1 in. from each end.

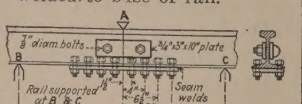


Load Applied At "A"	Deflection in in.
25,000 lb.	.0312
50,000 lb.	.0937
75,000 lb.	.3125
91,250 lb.	See below

One bolt sheared, weld broke on top and bottom on both sides of joint. Plate broke on one side.

Case 15
Electric Arc Weld

91 lb. 7 in. tee rail, ¾ in. x 3 in. x 10 in. splice bars bolted with two ⅞ in. bolts not welded. ¾ in. x 7 in. x 20 in. plate bolted to base with eight ⅞ in. bolts. Plate seam welded to base of rail.

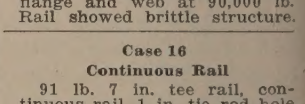


Load Applied At "A"	Deflection in in.
25,000 lb.	.0312
50,000 lb.	.0625
75,000 lb.	.1250
100,000 lb.	.1562
125,000 lb.	.2500
150,000 lb.	.4062
171,530 lb.	See below

One rail fractured through base and web in two places, fracture extended up into ball of rail, weld broke at joint, and between fracture points.

Case 16
Continuous Rail

91 lb. 7 in. tee rail, continuous rail, 1 in. tie rod hole at point of loading.



Load Applied At "A"	Deflection in in.
25,000 lb.	.0625
50,000 lb.	.0937
75,000 lb.	.1250
100,000 lb.	.1560
125,000 lb.	.1875
150,000 lb.	.3125
Prob. elas. limit 156,000 lb.	.3437
Prob. elas. limit 220,000 lb.	1st crack noted
241,000 lb.	2nd crack noted
245,100 lb.	Breaking strength of rail

Records of Detroit Joint Tests, Cases 1 to 16 Inclusive

These include tests of one acetylene weld, one thermit weld, eleven electric-arc welds, two splice-bar joints and one continuous rail.

oint plates, with the plates scarfed at a 45-deg. angle, op and bottom. This was done to determine whether greater penetration could be procured between the late and the rail, through the medium of scarfing the lates. In this test the plates cracked from the bottom carfing and split entirely across at 75,000 lb. The nference drawn from this test was that when the plates ere scarfed, only a knife edge of virgin metal was ft in the plates at the "fishing" sections.

Case 4 was seam welded for the full length of the late, top and bottom. This is the method followed by he Department of Street Railways in its seam-welded oints.

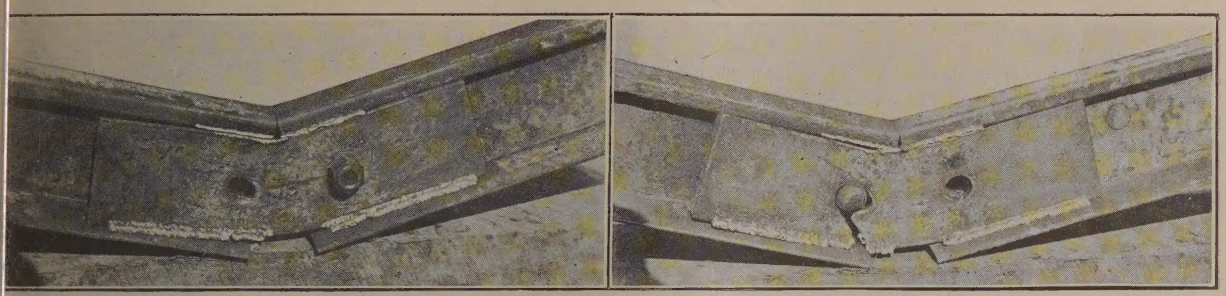
Case 5 used a 9-in. plate. When track construction n a large scale was begun in Detroit, difficulty was xperienced in procuring all of the 20-in. plates needed, ut there were on hand a large number of 9-in. plates hich the track department used for lining up the rack. It was thought worth while to try these plates in Case 8 sheared off due to the distortion of the plates. A comparison of the results with the 26-in. plate, 20-in. plate and 9-in. plate, indicates that the 9-in. plate is too short, and the 26-in. plate is too long. This leaves the 20-in. plate seemingly a happy medium. The distortion observed in Case 8 was in the plates.

Case 9 was a check test on Case 4.

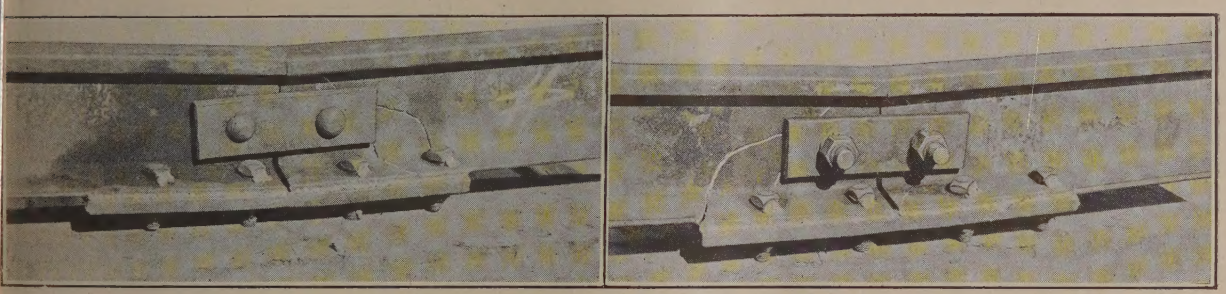
Case 10 was a check test on Cases 9 and 4, the only difference being that in Case 9 the rail was preheated and the acetylene weld was used instead of a metallic arc.

Case 11 was a Thermit weld. This test piece was made up by the Thermit company and showed up well, but no further tests were made because the standard track construction in Detroit calls for supported joints, and the Thermit weld would mean a suspended joint.

Case 12 was a full-length weld, top and bottom, with the plates scarfed 55 deg. instead of the 45 deg. shown in Case 3. The failure in Cases 12 and 3 is attributed



Case 8—Views of Both Sides of Joint After Failure



Case 15—Views of Both Sides of Joint After Failure

to see if they could be satisfactorily used in permanent construction. The test showed, however, that the joint with the 9-in. plate started to give at 35,900 lb., at which pressure the plates became distorted and pulled away from the weld on the ends. The weld failed completely at 40,850 lb.

Case 6 was where 4 in. of unwelded section had been left for 2 in. on each side of the joint, top and bottom. This arrangement was tested because of a suggestion that the action of the arc, while the seam weld was being made, changed the structure of the metal in the rail. If this was so, presumably the worst effect would be right at the joint between the rails.

Case 7 was tested to determine whether it was necessary to weld the full 20 in. of the plate, or if 8 in. of weld, properly distributed along the joint, would not be sufficient to develop the full strength of the plate, and at the same time give sufficient electrical conductivity.

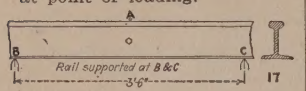
Case 8 was made up of a 26-in., six-bolt plate. All of the other tests, through Case 14, used a 20-in. plate, except Case 5, with a 9-in. plate, and Case 11, which was a Thermit weld. It will be noted that the welds in both instances to a lack of bearing between the plates and the rail in the "fishing" sections.

Case 13 was a test made with a joint having 8 in. of seam weld on the top seam and 16 in. on the bottom seam; the two lower seams beginning back 1 in. from the ends of the plate. This was done to find out if there was any evidence of "nicking" where the welds stop, and also to check the claim that a perfect joint should have the same deflection as the rail itself. Actually, the test showed that the two places where the weld stopped in the middle of the plate provided points for the weld to start ripping. This tendency to rip is naturally greater at the center of the plates than at the sides because there is a greater stress in testing this center point. Case 13 was checked by Case 14.

Case 15 was designed to test the theory that the use of a base plate increases the strength of the joint. A base plate welded for its full length was used, and in addition this plate was bolted to the base of the rail. The splice plates were used simply to keep the rails aligned and were not welded. It will be noted that this case shows notably greater strength than any of the joints previously tested.

Case 17
Continuous Rail

91 lb. 7 in. tee rail, continuous rail, 1 in. tie rod hole at point of loading.



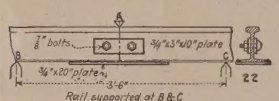
17

Load Applied At "A"	Deflection in in.
25,000 lb.	.0625
50,000 lb.	.0937
75,000 lb.	.1250
100,000 lb.	.1562
125,000 lb.	.2187
150,000 lb.	.3437
Prob. elas. limit	
166,150 lb.	.4687
1st crack noted	
184,000 lb.	
Beam of scale dropped	
226,000 lb.	2nd crack noted
229,050 lb.	See below

Rail buckled slowly in web below the ball at point of center loading and above tie rod hole and continued to twist to such an extent that the test was discontinued.

Case 22
Electric Arc Weld

91 lb. 7 in. tee rail., ¾ in. x 3 in. x 10 in. splice bars bolted with two ⅞ in. bolts, not welded. ¾ in. x 20 in. plate seam welded to base of rail.



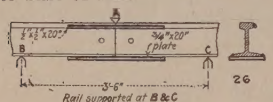
22

Load Applied At "A"	Deflection in in.
25,000 lb.	.0625
40,000 lb.	.0937
50,000 lb.	.0937
60,000 lb.	.1093
75,000 lb.	.1250
90,000 lb.	.1562
110,000 lb.	.1875
160,000 lb.	See below

Rail broke starting at the end of the seam weld on the base, welds did not break.

Case 26
Electric Arc Weld

91 lb. 7 in. tee rail, ½ in. x ½ in. x 20 in. plate welded to ball of rail, top seam only. ¾ in. x 20 in. plate seam welded to base of rail.



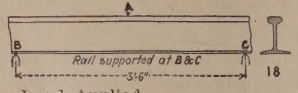
26

Load Applied At "A"	Deflection in in.
25,000 lb.	.0625
40,000 lb.	.1250
50,000 lb.	.1250
60,000 lb.	.1406
75,000 lb.	.1562
86,000 lb.	See below

Rail broke starting at the end of the seam weld on the base. Welds did not break.

Case 18
Continuous Rail

91 lb. 7 in. tee rail, continuous rail.



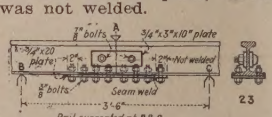
18

Load Applied At "A"	Deflection in in.
25,000 lb.	.0312
50,000 lb.	.0625
75,000 lb.	.0937
100,000 lb.	.1250
125,000 lb.	.1875
150,000 lb.	.2812
Prob. elas. limit	
175,000 lb.	.4375
213,000 lb.	1st crack noted
232,000 lb.	2nd crack noted
243,650 lb.	See below

Rail buckled in web just below the ball at the point of center loading, and continued to twist to such an extent that the test was discontinued.

Case 23
Electric Arc Weld

91 lb. 7 in. tee rail. ¾ in. x 3 in. x 10 in. splice bars bolted with two ⅞-in. bolts, not welded. ¾ in. x 20 in. plate bolted to base with eight ⅞-in. bolts. Plate seam welded to base of rail except for 2 in. at each end of plate, which was not welded.



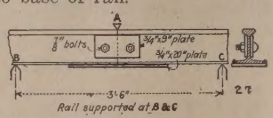
23

Load Applied At "A"	Deflection in in.
25,000 lb.	.0625
40,000 lb.	.0937
50,000 lb.	.0937
60,000 lb.	.1250
75,000 lb.	.1562
90,000 lb.	.1875
110,000 lb.	.2187
147,100 lb.	See below

Rail broke, starting at the end of the seam weld on the base. Welds did not break.

Case 27
Electric Arc Weld

91 lb. 7 in. tee rail, ¾ in. x 9 in. splice bars bolted with two ⅞ in. bolts, not welded. ¾ in. x 20 in. plate seam welded to base of rail.



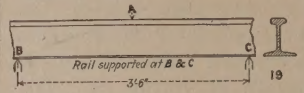
27

Load Applied At "A"	Deflection in in.
25,000 lb.	.0000
40,000 lb.	.0156
50,000 lb.	.0312
60,000 lb.	.0312
75,000 lb.	.0625
80,200 lb.	See below

Rail broke starting at the end of the seam weld on the base. Welds did not break.

Case 19
Continuous Rail

91 lb. 7 in. tee rail, continuous rail.



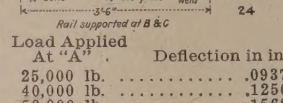
19

Load Applied At "A"	Deflection in in.
25,000 lb.	.0312
50,000 lb.	.0625
75,000 lb.	.0937
100,000 lb.	.1250
125,000 lb.	.1875
150,000 lb.	.3281
Prob. elas. limit	
175,000 lb.	.5625
229,250 lb.	See below

Rail buckled in web just below the ball at the point of center loading and continued to twist to such an extent that the test was discontinued.

Case 24
Electric Arc Weld

91 lb. 7 in. tee rail ¾ in. x 3 in x 10 in. splice bars bolted with two ⅞ in. bolts, not welded. ¾ in. x 20 in. plate bolted to base of rail with eight ⅞ in. bolts, using a 3 in. x 3 in. washer with every bolt. Plate seam welded to base of rail.



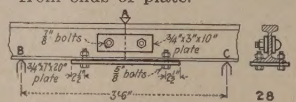
24

Load Applied At "A"	Deflection in in.
25,000 lb.	.0937
40,000 lb.	.1250
50,000 lb.	.1562
60,000 lb.	.1562
75,000 lb.	.1875
90,000 lb.	.2188
110,000 lb.	.2500
148,350 lb.	See below

Plate welded to base broke at the joint.

Case 28
Electric Arc Weld

91 lb. 7 in. tee rail. Splice bars bolted with two ⅞-in. bolts, not welded. ¾ in. x 20 in. plate seam welded to base of rail and bolted with four ⅞-in. bolts, each bolt 2½ in. from ends of plate.



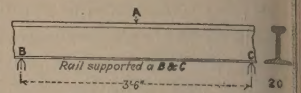
28

Load Applied At "A"	Deflection in in.
25,000 lb.	.0312
40,000 lb.	.0625
50,000 lb.	.0625
60,000 lb.	.0781
75,000 lb.	.0937
90,000 lb.	.1562
110,000 lb.	.1562
121,320 lb.	See below

Rail broke, starting at the end of the seam weld on the base. Welds did not break.

Case 20
Continuous Rail

91 lb. 7 in. tee rail, continuous rail.



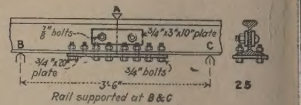
20

Load Applied At "A"	Deflection in in.
25,000 lb.	.0312
50,000 lb.	.0781
75,000 lb.	.0937
100,000 lb.	.1250
125,000 lb.	.1560
150,000 lb.	.2031
175,000 lb.	.3125
Prob. elas. limit	
258,730 lb.	See below

Rail buckled in web just below the ball at the point of center loading and continued to twist to such an extent that the test was discontinued.

Case 25
Electric Arc Weld

91 lb. 7 in. tee rail, ¾ in. x 3 in. x 10 in. splice bars bolted with two ⅞ in. bolts, not welded. ¾ in. x 20 in. plate bolted to base of rail with eight ⅞ in. bolts, not welded.



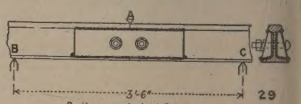
25

Load Applied At "A"	Deflection in in.
25,000 lb.	.0937
40,000 lb.	.2812
50,000 lb.	.4062
60,000 lb.	.5000
75,000 lb.	.6875
83,600 lb.	.9375
See below	

Bolts started to shear off at 83,600 lb. and continued until all bolts had sheared.

Case 29
Electric Arc Weld

91 lb. 7 in. tee rail 20 in. triangular splice bars seam welded top and bottom. Two ⅞ in. bolts spot welded.



29

Load Applied At "A"	Deflection in in.
25,000 lb.	.0312
40,000 lb.	.0312
50,000 lb.	.0312
60,000 lb.	.0312
75,000 lb.	.0625
90,000 lb.	.0937
110,000 lb.	.1093
140,520 lb.	See below

Rail broke at end of splice bars, weld did not break.

Records of Detroit Joint Tests, Cases 17 to 29 Inclusive

In these cases, tests were continued with the continuous rail and with the electric-arc weld in which a plate seam welded to the base of the rail was used. (There was no Case 21, for reasons explained in the text.)

Cases 16 to 20 inclusive show the results of transverse tests on straight rails. Cases 16 and 17 had tie-rod holes opposite the point of application of the load. All of these tests show very much higher strength than any of the joints. This seems to indicate that the welding in some way may weaken the rail.

There was no test No. 21. This number was left open for another test on a continuous rail if such a test should be considered desirable.

Case 22 was a joint with a seam-welded base plate without any bolts in the base of the rail. This was a check test on Case 15 to learn the effect of the bolts. It will be seen that in Case 15 the rail broke at 171,530 lb., and in Case 22 at 160,200 lb.

Case 23 covered a joint with a base plate bolted and welded, the weld being stopped 2 in. from the end of the plate. This was done to see whether this arrangement would stop trouble from nicking.

Case 24 covered a joint with a base plate seam-welded for its full length and bolted to the rail, but with a bevel washer under the head of the nut to distribute the strain over a greater area on the rail base.

Case 25 covered a joint made up with a base plate bolted but not welded. It will be noted that its strength is far less than when the base plate is seam welded but not bolted, as in Case 22.

Case 26 covered a joint with the base plate welded to the base of the rail for its full length, and a guide plate welded to the head of the rail to take the place of the ordinary joint plates. In this case the rail broke, so that the real value of this construction is hardly shown.

Case 27 had a seam-welded base plate with a pair of splice plates set up high to give a head support to the rail. This test was not conclusive because the rail broke at 80,200 lb.

Case 28 had a seam-welded base plate with four bolts instead of the eight bolts shown in Cases 15, 23, 24 and 25.

Case 29 had special solid triangular fish plates, seam welded top and bottom.

Case 30 had one-half of an International twin steel tie, seam welded to the base of the rail for its full length. The tie split entirely across at 193,800 lb.

Cases 30 and 31, which are of the same set-up, show conclusively the effect of a properly welded base plate as compared with anything that can be done in seam welding the fishplates. These give a strength of joint practically equivalent to that of a continuous rail.

Cases 32 and 33 show joints made up of the department's standard full-length seam weld of the joint plates, and a 6-in. weld between the base of the rail and International twin tie. In both these cases the rail broke at the base, starting at the end of the weld next to the tie and extending up through the bolt hole. In both these cases it would seem that there was too great a concentration of heat at the point where the short welds stop.

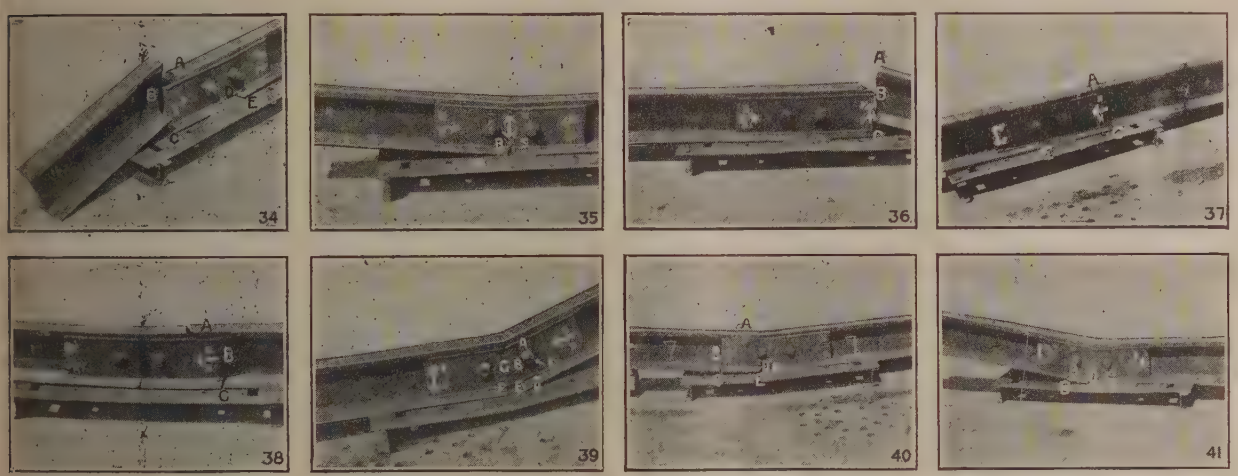
It will be noticed that in most of these tests the weld showed no sign of breaking down, but in practically every case either the plate or the rail broke.

Desirability of Preheating or Post-Heating

Cases 34 to 41 inclusive were made up to test (a) different methods of welding the rail to the International steel tie and (b) the desirability of preheating or post-heating. A record was kept in these cases of the points where the welding of the splice bar to the rail was started and finished. If the joint broke at the point where the weld was started, it would be obvious that preheating is required, since as the arc is continued along the seam weld it automatically preheats ahead of it. On the other hand, if the weld broke at the point where the welding was stopped, it would seem that post-heating is needed.

Case 34 was a joint made up in a manner similar to Cases 32 and 33, except for the spot welding of the bolts and nuts. The rail broke at two points, showing complete failure near the end of the joint plate and partial failure of the base of the rail at the center. Other welds were intact, except a short section of the bottom weld of one joint plate. In the photograph of the broken specimen, *ABC* is the rail break, and *DE* the crack in the rail base. In the drawings and photographs *S* shows the starting point and *F* the finishing point of the seam welds between splice bars and rail.

Case 35 was a check test on Case 34 except in the direction in which the welds were made. Here the base of the rail and part of the web broke near the joint. One tie seam between the base of the rail and the tie showed partial failure. The joint plates and the other welds were intact. In the photograph, *AB* represents the break in the base of the rail.



Views of Joints 34 to 41 After Failure

Case 36 was made up the same as Case 34, except that both the tie welds were lapped back at both ends for about 1½ in. Here the rail broke in two places, a complete rail failure at the end of the joint plate and failure of the rail base near one end of the tie seam. Other welds, the joint plates and the tie plate were intact. The rail failure is shown as *ABC* in the photograph.

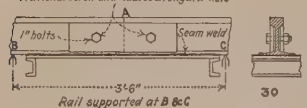
Case 37 was a check test on Case 36. The rail broke in two places—completely near the end of the joint plate, and the rail base at the end of the tie seam. One joint plate cracked from the bottom to the bolt hole. Otherwise, welds and plates were intact. In the photograph, *ABC* is the rail failure, and *DE* the base break.

In cases 34 to 37 inclusive the failure was at about the same magnitude of load application. The breakage was in the rails, the welds holding up well.

Case 38 was made up in a manner similar to the four preceding cases, except that two tie welds each 3½ in. long at the ends were substituted for the 6-in. or 6½-in. weld at the center of the tie. Here the rail broke at one end of the joint plate, and the tie weld between one end of the steel tie and the rail failed. Otherwise, plates and welds were intact. The photograph shows *ABC* as the broken rail.

Case 30
Electric Arc Weld

91 lb. 7 in. tee rail, ⅜ in. x 20 in. splice bars bolted with two 1 in. bolts, not welded. International steel tie welded to base of rail.



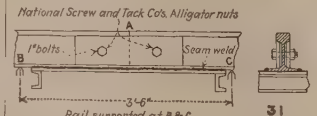
Only one-half International steel tie used.

Load Applied At "A"	Deflection in in.
25,000 lb.	.0625
40,000 lb.	.1250
50,000 lb.	.1250
75,000 lb.	.1875
90,000 lb.	.2500
100,000 lb.	.3125
177,800 lb.	Prob. elas. limit
193,800 lb.	Failure

Tie split entirely across at line of junction of the two rail sections. Weld unbroken, both bolts stretched allowing plates to warp slightly.

Case 31
Electric Arc Weld

91 lb. 7 in. tee rail, ⅜ in. x 20 in. splice bars bolted with two 1 in. bolts, not welded. International steel tie welded to base of rail.



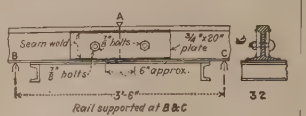
Only one-half International steel tie used.

Load Applied At "A"	Deflection in in.
25,000 lb.	.0000
40,000 lb.	.0312
50,000 lb.	.0625
75,000 lb.	.0937
90,000 lb.	.1250
100,000 lb.	.1250
125,000 lb.	.1562
150,000 lb.	.2500
229,700 lb.	.8750

Failure occurred at 229,700 lb. Results same as in Case 30.

Case 32
Electric Arc Weld

91 lb. 7 in. tee rail, ⅜ in. x 20 in. splice bars bolted with two ⅞ in. bolts. Plates seam welded top and bottom. Base of rail welded to one-half of International steel tie.

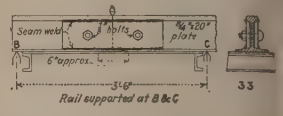


Load Applied At "A"	Deflection in in.
25,000 lb.	.0625
40,000 lb.	.1250
50,000 lb.	.1250
62,400 lb.	.1875
75,000 lb.	.2500
82,000 lb.	.9062
82,400 lb.	3.3125

Rail broke at one e, starting at end of weld to tie, extending up through bolt hole. Splice bar broke at bottom, extending up through bolt hole.

Case 33
Electric Arc Weld

91 lb. 7 in. tee rail. ⅜ in. x 20 in. splice bars bolted with two ⅞-in. bolts. Plates seam welded top and bottom. Base of rail welded to one-half of International steel tie.

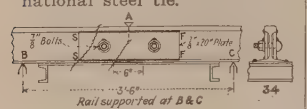


Load Applied At "A"	Deflection in in.
25,000 lb.	.0312
40,000 lb.	.0937
50,000 lb.	.1250
75,000 lb.	.1875
87,000 lb.	.3437
87,100 lb.	3.1875

Results same as in Case 32.

Case 34
Electric Arc Weld

91 lb. 7 in. tee rail, ⅜ in. x 20 in. splice bars bolted with two ⅞ in. bolts, bolts and nuts spot welded, plates seam welded top and bottom, base of rail welded to one-half of International steel tie.



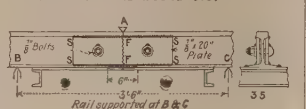
Load Applied At "A"	Deflection in in.
25,000 lb.	.0625
40,000 lb.	.0625
50,000 lb.	.1250
60,000 lb.	.1250
75,000 lb.	.1250
90,000 lb.	.1875
92,000 lb.	1st report
100,000 lb.	.2500
105,950 lb.	See below

Rail failed at two points. welds intact, except part of bottom weld of one splice bar.

Note.—For explanation of "F," "S" and wavy lines for this and following tests, see note under Case 41.

Case 35
Electric Arc Weld

91 lb. 7 in. tee rail, ⅜ in. x 20 in. splice bars bolted with two ⅞ in. bolts, bolts and nuts spot welded. Plates seam welded top and bottom. Base of rail welded to one-half of International steel tie.

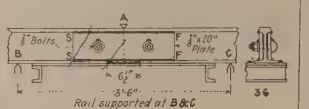


Load Applied At "A"	Deflection in in.
25,000 lb.	.0625
40,000 lb.	.0625
50,000 lb.	.0625
60,000 lb.	.1250
75,000 lb.	.1250
90,000 lb.	.1562
100,000 lb.	1st report
105,170 lb.	.1875
118,700 lb.	1.2812

Rail failure near joint. Partial failure of one tie seam. Other welds and splice bars intact.

Case 36
Electric Arc Weld

91 lb. 7 in. tee rail, ⅜ in. x 20 in. splice bars bolted with two ⅞ in. bolts, bolts and nuts spot welded. Plates seam welded top and bottom. Base of rail welded to one-half of International steel tie.

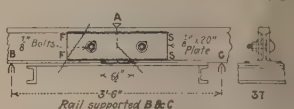


Load Applied At "A"	Deflection in in.
25,000 lb.	.0156
40,000 lb.	.0312
50,000 lb.	.0468
54,000 lb.	1st report
60,000 lb.	.1250
75,000 lb.	.1562
90,000 lb.	.2187
96,100 lb.	See Below

Rail broke at 2 points. Welds and splice bars intact.

Case 37
Electric Arc Weld

91 lb. 7 in. tee rail, ⅜ in. x 20 in. splice bars bolted with two ⅞ in. bolts, bolts and nuts spot welded. Plates seam welded top and bottom. Base of rail welded to one-half of International steel tie.

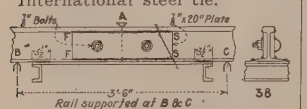


Load Applied At "A"	Deflection in in.
25,000 lb.	.0312
40,000 lb.	.0468
50,000 lb.	.0625
60,000 lb.	.1250
72,000 lb.	1st report
75,000 lb.	.1406
90,000 lb.	.1562
103,900 lb.	See below

Rail broke at two points. One splice bar cracked from bottom to bolt hole. Welds intact.

Case 38
Electric Arc Weld

91 lb. 7 in. tee rail, ⅜ in. x 20 in. splice bars bolted with two ⅞ in. bolts, bolts and nuts spot welded. Plates seam welded top and bottom. Base of rail welded to one-half of International steel tie.

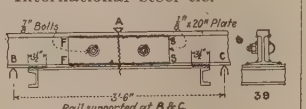


Load Applied At "A"	Deflection in in.
25,000 lb.	.0312
40,000 lb.	.0625
50,000 lb.	.0937
53,000 lb.	1st report
60,000 lb.	.1250
75,000 lb.	.1250
90,000 lb.	.1562
95,000 lb.	2nd report
100,000 lb.	.1875
110,000 lb.	.2031
120,000 lb.	.2500
138,000 lb.	1.0000

Rail broke at end of splice bar. Tie weld at one end failed. Plates and other welds intact.

Case 39
Electric Arc Weld

91 lb. 7 in. tee rail, ⅜ in. x 20 in. splice bars bolted with two ⅞ in. bolts, bolts and nuts spot welded. Plates seam welded top and bottom. Base of rail welded to one-half of International steel tie.



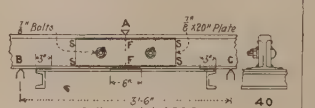
Load Applied At "A"	Deflection in in.
25,000 lb.	.0000
40,000 lb.	.0156
50,000 lb.	.0468
60,000 lb.	.0781
75,000 lb.	.1250
85,000 lb.	1st report
90,000 lb.	.1250
100,000 lb.	.1718
110,000 lb.	.2031
120,000 lb.	.2500
128,100 lb.	3.1250

Complete Failure

Both splice bars split at center. Numerous breaks in joint plate welds. Tie welds at one end failed.

Case 40
Electric Arc Weld

91 lb. 7 in. tee rail, ⅜ in. x 20 in. splice bars bolted with two ⅞ in. bolts, bolts and nuts spot welded. Plates seam welded top and bottom. Base of rail welded to one-half of International steel tie.



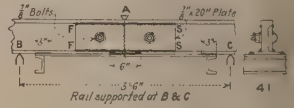
Load Applied At "A"	Deflection in in.
25,000 lb.	.0000
40,000 lb.	.0000
50,000 lb.	.0000
60,000 lb.	.0312
75,000 lb.	.0625
90,000 lb.	.0625
100,000 lb.	.1250
110,000 lb.	.1250
120,000 lb.	.1406
130,000 lb.	1st report
132,650 lb.	

Complete destruction

Rail broke in two places. One splice bar weld failed at one end. Tie welds at one end failed. Splice bars intact.

Case 41
Electric Arc Weld

91 lb. 7 in. tee rail, ⅜ in. x 20 in. splice bars bolted with two ⅞ in. bolts, bolts and nuts spot welded. Plates seam welded top and bottom. Base of rail welded to one-half of International steel tie.



Load Applied At "A"	Deflection in in.
25,000 lb.	.0000
40,000 lb.	.0000
50,000 lb.	.0312
60,000 lb.	.0625
75,000 lb.	.0937
96,000 lb.	.1250
100,000 lb.	.1406
110,000 lb.	.1562
120,000 lb.	.1875
127,600 lb.	1st report
130,100 lb.	2.3750

Test Discontinued

Rail broke near joint. One splice bar split. Tie welds at one end of tie failed, other welds intact.

Note:

Previous to Case 34 no record was kept of start and finish of weld, or of point of fracture.

"S" shows starting point of welding on seam welds between splice bars and rail.

"F" shows finish point of welding on seam welds between splice bars and rail.

Wavy lines show where rail and splice bars broke under load as applied.

Records of Final Detroit Joint Tests, Cases 30 to 41 Inclusive

These all relate to seam-welded joints with an International steel tie welded to the base of the rails

Case 39 was a check test on Case 38. Here both joint plates split at the joint and through the bolt holes. There were numerous cracks and breaks in the joint plate welds, and both tie welds at one end of the tie failed. In the photograph, *ABC* and *G* show the breaks in the joint plates, and *DEF* the points of failure of the plate welds.

Case 40 was made up with tie welds at the rail joint and at the ends of the tie. In this case the rail broke in two places; complete failure at one end of the joint plate and breakage of the base of the rail near the center joint. The joint weld cracked on one end near the bottom center, and the tie welds at one end of the tie failed. The joint plates remained intact. In the photograph, *ABC* shows the rail break, *DEF* the rail base failure.

Case 41 was a check test on Case 40, except in the direction in which the welds were made. Here the base of the rail broke near the joint, one joint plate cracked and the other plate split through the center. The tie weld at one end of the tie failed, with the other welds intact. In the photograph, *AB* shows the break in the base of the rail, and *CD* the break and split in the joint plates.

Conclusions from Cases 34-41 Inclusive

The most effective method of welding the tie to the rail is by a short weld at each end of the tie. This gives a distinctly stronger joint than with a tie weld just at the joint. When tie welds are used at the ends of the tie, it is more or less superfluous to make the center tie weld.

No definite conclusions could be drawn as to the desirability of preheating or post-heating. Records were kept of the point of starting and finishing each joint plate weld, but these welds held up almost uniformly, and where failure took place, it was not consistent in its relation to the point where the weld was started or finished.

Welding Wire

During the course of these experiments the department has used a number of different makes and kinds of welding wire. A great variation has been found in the chemical composition of the numerous welding wires now on the market, as well as in their qualities of "laying in" without sputtering during the welding process. The wire used recently by the department for track welding has been the No. 9 wire of the Wilson company, but tests are now being made at the department chemical laboratory to determine whether changes in the chemical composition of this welding wire for Detroit conditions can be made to advantage.

Cast-Welded Joints

As about 80 per cent of the Detroit city rail joints in the past have been made by the cast-welded process, the department has naturally taken out many of these joints in its work of rehabilitation. Altogether, nearly 700 of these joints have been removed, though this does not represent the total number of cast-welded joints discovered to be defective during the work of reconstruction. When a cast-welded joint in track which is not being replaced is found mechanically good but electrically defective, the department simply bonds around it. If mechanically defective, a section of rail 6 ft. in length is cut out and replaced by a section seam welded by joint plates to the adjoining rails.

The largest proportion of cast-welded joints removed were defective because (1) the ball of the rail had broken out of the joint and the rail was pumping, (2) the rail was split vertically, generally at the casting, or (3) the bottom part of the weld was split off horizontally. Table I gives a record of cast-welded joints removed between May 15, 1922, and April 9, 1923.

Typical forms of broken joints are illustrated.

Chemical Analysis of Cast-Welded Joints

To determine any chemical and physical effects in the rail at the joint caused by the cast-welding process, a typical joint was selected, and a chemical analysis made. Test specimens were taken of the casting at five points and of the rail at two points. The results are given in Table II.

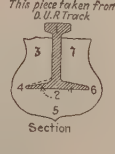
TABLE I—RECORD OF CAST-WELDED JOINTS REMOVED BETWEEN MAY 15, 1922, AND APRIL 9, 1923

Cracked underneath the ball of the rail	579
Ball of rail broken in casting	64
Casting broken	14
Rail broken through the web inside the casting	9
Rail broken at the end of the casting	7
Rail broken, beginning at the casting and ending some distance away	1
Solid joints	6
Total joints removed	680

As will be seen from the table, no great change was made in the chemical composition of the rail by the process, but the hardness of the section of the rail not inclosed by the weld is higher than at the base of the rail. It is thought this may be due to a slight softening of the base of the rail when the molten metal was poured on it with the slow cooling of the heavy mass. It may also be possible that the head of the rail became compressed and so harder than it was originally through pounding of the car wheels over it in service. The test also showed that the only place at which there was any fusion in the joint was near the bottom of the rail evidently on the side where the molten metal was poured into the mold surrounding the rail end. This is indicated in the drawing, in which the dotted line represents the original form of the rail and the solid line shows the actual edge as it existed in the weld.

TABLE II—CHEMICAL ANALYSIS AND HARDNESS RECORD OF TYPICAL CAST-WELDED JOINT REMOVED

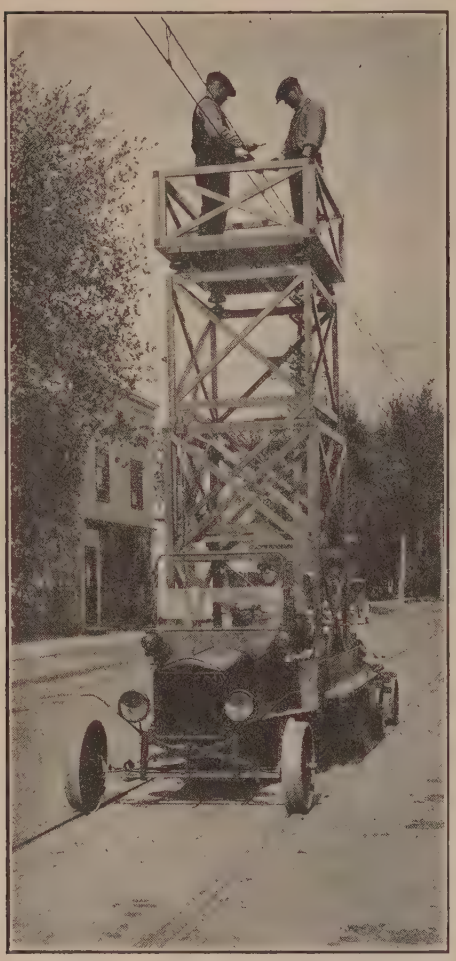
Carbon Per Cent	Phosphorus Per Cent	Manganese Per Cent	Sulphur Per Cent	Silicon Per Cent	Brinell Hardness	No.
0.741	0.041	0.722	0.0367	0.073	292	1
0.762	0.041	0.734	0.0285	0.085	278	2
3.28	0.434	0.428	0.0364	1.70	142	3
3.58	0.446	0.476	0.0426	1.53	134	4
3.57	0.443	0.459	0.0372	1.69	134	5
3.54	0.428	0.476	0.0356	1.57	133	6
3.54	0.454	0.453	0.0426	1.65	144	7



One cause of the poor results in these cast welds is believed to be the lack of care as to the quality of the iron used in the welding cupola. The cupola was evidently used as a catch-all for all kinds of scrap iron about the property, such as broken car wheels and brakeshoes. In one case a half fused bolt was found imbedded in the weld, evidently having passed through the gate before it was fully melted.

Summary

In summary, it may be said that the tests on seam and cast-welded joints in Detroit indicate (1) that the cast-welding process, besides being more inconvenient to apply, is less reliable for rail joints than the seam-welding process; (2) that the method of joint construction with seam-welded joints used in Detroit is effective both mechanically and electrically, and (3) that further study of the metallurgy of electrically welded rail joints is desirable.



The Line Car Is Insulated for High Voltages

Self-Propelled Line Car Useful on Interburban

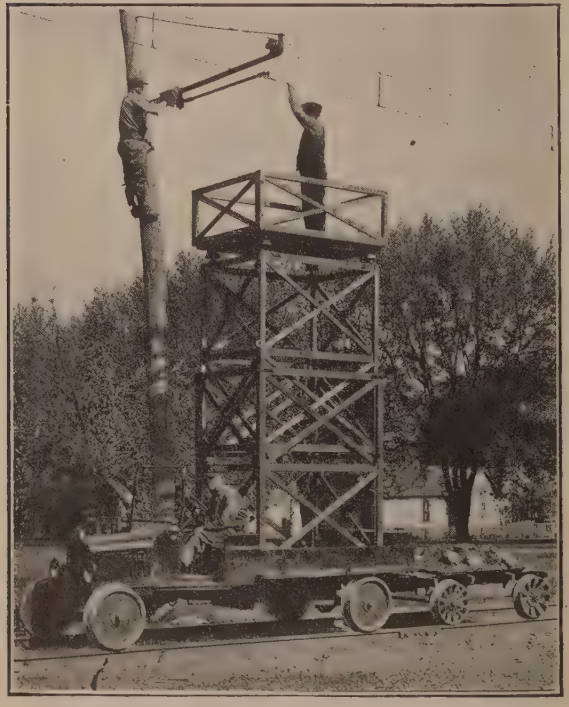
Line Car Made from Ford Truck Can Go Anywhere, Even Though Power Is Off—Useful Both for Line Work and General Construction

A VERY flexible type of line and work car has been constructed by the Windsor, Essex & Lake Shore Railway at Kingsville, Ont. This machine has been in use for several months and has been found especially advantageous for all purposes. A standard Ford truck chassis was used as a basis, the pneumatic tires and wheels being removed and wooden wheels with steel tires having an M.C.B. tread substituted. These wheels were supplied by the Kalamazoo Railway Supply Company. On the bed a collapsible tower was built of long-leaf fir. This was carefully dried out and given three coats of insulating varnish. On top of the tower directly beneath the platform were mounted four 66,000-volt insulators, which give sufficient protection when the men are working on the high-voltage trolley wire. The railing on the tower can be folded flat, as shown in one of the illustrations, so that when the tower is lowered and the railing dropped, the total height above the ground is only about 12 ft. This enables it to pass under any ordinary obstruction.

By removing the four bolts that hold the car to the bed, it can be taken off and the body used for transporting material; seats also can be supplied so that the car can be used as a passenger car to carry twelve men. The engine has sufficient power to drive the car at 20 m.p.h. on the track. It is also possible to haul a small lorry or a flat car to carry a load of material.

The valuable feature of this car, especially in interurban work, is that it can run when the wires are dead. Since this is a single-track line a break in the trolley wire would in certain cases require taking off all power, so that it would be quite difficult to reach an isolated location if an electric line car were used.

In remodeling the Ford truck the steering device was not removed from the front wheel, but was merely tightened up. It is possible to take the car off the track by means of a derailing block, and run the



A Small Trailer Can Be Hauled by the Line Car

The Car Can Travel on an Ordinary Road Under Its Own Power

achine onto a road, just as well as the ordinary conruction gang can a hand car. The machine can be erated for considerable distances on its own power laying boards for the wheels to run on. In fact, it possible to run without the use of boards.

Where it is not possible to run the car off the track r turning it around a novel arrangement can be used. point at the exact center of the car is marked on the lassis. A small telescoping hydraulic jack is carried the equipment. The car can be stopped so that its center is directly over a tie, so that the car can be jacked up at the center and spun around. Even though it may not be in exact balance one or two men can take care of the excess weight and swing the car with little difficulty.

The work of constructing the car on the Ford chassis was all done in the company's plant, and the cost of the entire outfit was less than $1,000. It was designed by Albert Eastman, formerly vice-president and general manager of the system.

Specifications for Labor

The Power and Equipment Department of the Connecticut Company Has Drafted Specifications for the Work Required in Car Overhauling and Periodic Inspections—It Also Has a Simple System for Tabulating and Charting Essential Data

AS EXPLAINED in an article which appeared in the July 7 issue of this paper, the power and equipment department of the Connecticut Company has developed charts covering the functions and luties of the heads of the various departments. In ddition, the department maintains graphical records f every element of the power and equipment operations nd has established a series of monthly ratings for timulating the power and equipment work among the arious divisions of the company. It has also drafted series of specifications for such equipment work as verhauling, mileage inspection and daily inspection, so hat each department and each department head may now exactly what is to be done under each of these lasses of work. In other words, the department has pplied to labor the same principles of standardization y specification as it applies to material purchased, vith a resulting more definite understanding by every ne along the line of what is wanted.

All shop work is done by specifications, drafted as arefully as if they were specifications for the purchase of material. There are three general specifications for shop work, namely (1) covering general overhaul of rolling stock; (2) covering mileage inspection, based on a service of 1,000 miles for city cars and 1,500 miles for interurban cars, and (3) daily inspection. On page 98 a few extracts of the specifications for overhaul are printed to give an idea of their nature. The specifications for mileage and daily inspection follow and are published in full.

There are several points about these specifications which are not apparent in their text, but they add much to the convenience of their use. One of these is that practices in the work of overhaul which are likely to change are made the subject of supplemental instruction rather than being embodied in the main specifications which are printed and consequently semi-permanent. An example of the practice method is shown under the specification on painting which says that the work shall be carried out in accordance with letter of instruction 179, with the application of colors given in two other letters of instruction. In this way it is pos-

DAILY REPORT OF CARS REMOVED FROM SERVICE DATE ______ 19__

______ COMPANY ______ DIVISION ______ CAR HOUSE

CAR No.	BODY AND MECH.													
	Damaged 1	Body Defect 2	Register 3	Brok. Trol or Reg C'rd 4	Gong 5	Sand Out 6	Sand Clogged 7	S. B. Failure 8	Catcher or Retriever 9	Scrapers 10	Broken Glass 11	Signs 12	Fender 13	Miscellaneous 14

CAR No.	ELEC. EQUIP. BODY														
	Trol. Wheel or Fork 15	Trol. Pole or Stand 16	Circuit Breaker 17	Controller 18	Resistance 19	M.U.Controll or Rev. 20	M.U. Miscellaneous 21	Headlight 22	Heaters or H. Switch 23	Misc. Switches 24	Lights Out 25	Power Wiring 26	P. B. Signals 27	Lgt-Heat-Air-Wiring 28	Miscellaneous 29

CAR No.	MOTORS									
	Hot bearings 30	Lead Wires 31	Flashing 32	Arm G'd or B. O. 33	Fields G'd 34	B. H. or Yoke 35	Pin or Gear 36	Gear Case 37	Broken Bolts 38	Miscellaneous 39

CAR No.	TRUCKS									
	Hot Bearing 40	Frame Defect 41	Wheel Defect 42	Axle Defect 43	Shoe Defect 44	Shoe Head Defects 45	Brake Rods 46	Turn Buckles 47	Slack Adjuster 48	Miscellaneous 49

CAR No.	BRAKES													
	Brakes Poor—Hand 50	Brakes Poor—Air 51	Comp. Mech. Trouble 52	Comp. Air or Field 53	Comp. B. H. 54	Comp. Air Governor 55	Fuse Blown 56	Engr's Valve 57	Pipe—Leak or Break 58	Miscellaneous 59	No Trouble Found /	Repairs or Inspection X	Misc. Trouble ⊤	MOTORMANS No.

CORRECT ...... CAR BARN FOREMAN — EXAMINED ...... SUPT. — EXAMINED ...... M. M. — APPROVED ...... MANAGER

Every car that is taken off a run for a reported trouble or inspection must be noted on this report by a dot in proper column and opposite car number. Dot inside of a circle indicates a removal due to operating condition and is not considered a mech. or elec. failure or defect.

These reports shall be made out daily in duplicate by the Car Barn Foreman, who will send both to the Master Mechanic or Superintendent, who will retain the copy, sending the original to the Division Manager.

This Is Half of the Form Kept by the Statistical Department to Give a Continuous Record of Causes of Pull-Ins

THE CONNECTICUT COMPANY

ENGINEERING DEPARTMENT SPECIFICATION NO. 627-72122 SUPERSEDING SPECIFICATION NO. 627-21421 COVERING GENERAL OVERHAULING OF ROLLING STOCK

SCOPE

General.—This specification covers in general the overhauling of motor cars at the expiration of a predetermined mileage and is intended to cover so-called "Back Shop Work," consisting of general overhauling or heavy repairs.

Mileage.—All double-truck closed passenger cars shall be overhauled according to this specification at the expiration of a 100,000-mile period of service.

All single-truck closed cars, all express, stone and other revenue, motor freight and express cars shall be overhauled in line with this specification at the expiration of a 75,000-mile period of service.

All non-revenue cars, such as service cars, work cars, line cars, supply cars, snow plows, snow sweepers, etc., shall be overhauled when they require it.

Each master mechanic is expected to keep in very close touch with the physical condition of rolling equipment under his charge, and if there are any cars of any nature that are not safe to operate or, in the case of cars which are overhauled on a mileage basis and which cannot complete the mileage specified above, the car should be immediately withdrawn from service and the matter taken up with this department for permission to overhaul the car in advance of its regular schedule.

A. E. R. A. Standards.—In so far as it is practical it is the intention of the engineering department to follow the standards as adopted by the American Electric Railway Engineering Association. Each master mechanic is expected to make himself conversant with these standards and will be advised which of these standards have been adopted by the Connecticut Company in whole or in part.

CAR BODIES

General.—Car bodies shall be lifted from the trucks, thoroughly inspected, cleaned and overhauled. They shall be washed and all necessary repairs made to frame, roof, floors, platforms, steps, bumpers, etc. A careful inspection shall be made for loose fittings or parts, such as grab handles, door hinges, window catches, screws, nails, and any parts liable to cause accident, inconvenience or poor appearance shall be repaired or renewed.

Car bodies need not necessarily be painted when general overhauling is made unless they actually require it.

Painting.—When it is necessary to repaint cars (this need not necessarily be at the same time the car is overhauled) the enamel system of car painting shall be used, unless otherwise specified by the engineering department. This work shall be carried out in accordance with letter of instruction No. 179. For details as to use of different colors see letter of instruction No. 203, and for special paint and colors see letter of instruction No. 247.

Curtains, Car.—All curtains are to be washed and where required removed, repaired and renovated. On all renewals standard curtain material will be used, which is dark green double-coated Pantasote, color No. 86, except in cases where it does not match up with existing curtains. In so far as possible the practice shall be followed of equipping one car complete with new standard curtains and using the curtains removed from this car to match up with old style curtains in other cars.

All curtain fixtures shall be thoroughly gone over. Springs so adjusted that curtain will operate properly, catches lubricated and curtain placed in first-class operating condition.

Curtains, Vestibule.—All vestibule curtains shall be thoroughly cleaned and applied in accordance with letters of instruction Nos. 84 and 159. The height of the bottom of the curtains from the floor shall be approximately 36 in. The material of all curtains shall be brown denim, supported by iron rings (not over 6-in. spacing) on iron rods. All cars that are now equipped with roller curtains shall be changed to the sliding type of curtain.

Steps.—Car steps shall be thoroughly gone over and necessary repairs made. Where treads or risers are badly worn they shall be replaced. The heights shall be checked in accordance with letter of instruction No. 261, namely: Where underframe and equipment construction will permit doing so on the closed cars now in service the distance from the top of the rail to the top of the step must not be more than 15 in. From the top of the step to the vestibule floor shall not exceed 13 in., and under any circumstances these heights shall not exceed 16½ in. and 15½ in. respectively. On double-truck open cars the first, or bottom step, of the double folding steps shall not be over 16 in. above the top of the rail and the second step shall not be more than 13 in. above the first step, and not more than 13 in. below the floor of the car.

Closed cars purchased previous to 1916, when requiring new steps or treads, shall be equipped with standard car step as shown on drawing No. C-404 and covered by letter of instruction No. 148.

Heaters and Heat Regulation.—Heater switches to be inspected, tested and placed in good condition. Broken handles, burned fuse clips and connections to be renewed and covers closed properly. Heaters shall be properly fastened in place and circuits closed. Each circuit shall be tested with an ammeter to find if heaters are up to requirements and no short circuits and irregularities exist. In repairing heaters all enamel crimp rods shall be renewed with porcelain. Heaters and automatic heat regulators shall be carefully inspected and cleaned and connections tested. The heat regulator should be operated by short circuiting thermostat connections to determine if in working order and the heat regulator boxes locked in accordance with letter of instruction No. 201.

Lighting Circuits.—All lighting circuits to be thoroughly inspected and tested. Sockets of the same type shall be used throughout in individual cars. If it becomes necessary to change the headlinings in the older type of closed cars they shall be rewired in accordance with letter of instruction No. 103, drawing No. C-572. All lighting switches and fuse blocks to be thoroughly cleaned and tested and defective ones replaced. Each switch and fuse shall be marked distinctly "Light Circuit" in small letters. For standard types of snap switches, receptacles, sockets, plugs, cleats, rosettes, combination shade holders, sockets and shades see letter of instruction No. 144.

BRAKES

General.—Extreme care must be taken in inspecting and overhauling brake equipment and foundation brake rigging. The brake rigging shall be checked to see that the present braking power, i.e., the relation between brake-shoe pressure and the empty weight of the car, falls within the range of 90 and 100 per cent with 55 lb. of air pressure. This should be checked in accordance with the formula shown on drawing No. C-6.

Compressors.—Compressors shall be thoroughly cleaned and inspected. All bearings shall be tested for wear, lost or defective bolts replaced, valves removed and cleaned, vents cleaned out, back head and pistons removed, cylinders cleaned, greased, reassembled and tested for leakage. Compressor then refilled with oil while at rest and given a five-minute performance test. Compressors requiring extensive repairs shall be sent to the reclamation shop.

Governors.—Governors shall be thoroughly cleaned, wearing parts lubricated, arcing tips inspected and governor tested for proper operation.

Strainers.—Strainers to be removed and inspected. Hair-packed type to have hair removed, cleaned and repacked. Oil strainers to be washed out with kerosene and refilled. Strainers shall be installed on cars in accordance with letter of instruction No. 156.

Hand Brakes.—All hand-brake gearing, guides and bearings to be cleaned and oiled, care being taken that they are free from fouling, preventing unrestricted action. Hand brakes should work in harmony with air brakes.

Piston Travel.—Piston travel should be free and unrestricted and after the car is overhauled and with the car standing, should not exceed a maximum of 4 in. in accordance with letter of instruction No. 171.

CONTROL

General.—Controllers, main switches, line switches, switch guards, reversers, circuit interrupters, etc., shall be carefully inspected and thoroughly cleaned. Badly-worn fingers and segments to be replaced. Contacts that are badly burned to be filed smooth and adjusted or replaced by new ones. All charred insulating surfaces to be scraped and shellacked. Tighten bolted connections. All wires, cables, leads, bushings, connections, etc., shall be placed in first-class condition, well cleated with no loose connections.

Controllers.—All controllers shall be thoroughly blown out, cleaned and repainted and lubricated where necessary. All controllers shall be equipped with wooden covers. All controller fingers to be cleaned, filed and adjusted and replaced where necessary. For adjustment of fingers see letter of instruction No. 164.

sible for a change to be made in the methods of painting or in colors without requiring a change in the general specifications.

Another point is that the second number in the specification number gives the date on which the specification was issued, so that this date is apparent to anyone using the specifications. Thus there are two numbers at the head of the specification covering general overhaul. These numbers automatically declare that the specification on overhaul issued on July 21, 1922, superseded the specification for general overhaul issued on Feb. 14, 1921.

Comparative Record on Overhauling

The specifications declare what system and methods should be used, but if the work were not followed up they would be of little value. The same thorough method of following up work is employed, however, as in specifying in the first place what is wanted.

The company requires from the foreman of each of its nine repair shops a report of the number of cars overhauled during each week. This information is tabulated to include also the number of cars overhauled during the year to date, the cars reported due for overhauling at the time the report is filed and the percentage of cars scheduled for overhauling that have been completed up to that date. Copies of this tabulation are sent to the president, manager and chief engineer of the company and also to the master mechanic and the superintendent of each division.

All overhauled cars have to be viséd by an inspector from the main office before being put back into service. There are two of these traveling inspectors, one for the northeastern and the other for the southeastern part of the state. They report on the condition of every part of the car, by means of the "Car Inspection Report" reproduced. A copy of this report is sent to the master mechanic of the division on which the car was inspected, and a copy is kept in New Haven.

Checking Pull-Ins

On these reports the master mechanic is required to list the cause or causes for which every car is removed from service, the purpose of course being to determine if any car has a chronic ailment. In the method followed, however, the clerical work required at division shops or division headquarters in making out these reports on cause of failure has been reduced to a minimum.

CAR INSPECTION REPORT

Division ——— Date ..... 19 . Car No. . Rating ..

CAR BODY

Cleanliness	Sand Boxes
Bell and Cord	Grab Handles
Register and Fittings	Steps and Hangers
Hand Straps and Rod	Guard Rails
Curtains and Fixtures	Scrapers
Glass	Draw Bars and Cage
Ventilators	Dashers
Signs	Gongs
Seats and Cushions	Roof
Floor	
Doors, Car and Vest.	

TRUCKS, JOURNALS AND BRAKE RIGGING

Brake Handle	Wheels
Brake Staff	Wheel Gauge
Brake Dog	Truck Frames
Brake Chains	Springs
Brake Rods	Truck Yokes
Brake Levers	Axles
Brake Pins	Journals
Brake Heads	Journal Bearings
Brake Shoes	Journal Boxes
Center Plates	
Side Bearings	

MOTORS

Motor Axle Bearing	Motor Covers
Axle Collars	Hand Hole Covers
Armature Bearings	Motor Leads
Armature Dust Guard	Cables
Gear and Casing	Resistance Grids
Pinions	Leads and Connections
Motor Suspension	Brushers and Holders
Motor Bolts	Lightning Arrester
Motor Clearance	Choke Coils
Armature Clearance	
Motor and Field Loops	

TROLLEY AND MISCELLANEOUS ELECTRIC EQUIPMENT

Trolley Wheel	Light Circuit
Trolley Bushing	Headlight Circuit
Pin and Harp	Heater Circuit
Springs and Washers	Sign Lights
Hook and Pole	Buzzer Circuits
Base and Spring	Door Circuits
Tension	Door Switches
Catchers and Cord	Push Buttons
Power Circuits	Heaters
Lamps and Fixtures	

AIR BRAKES

Compressor	Emergency Valve
Brake Cylinders	Governors
Piston Travel	Whistles
Air Pipes	Air Gauge
Air Valves	Reservoir
Air Fittings	
Engineer's Valve	

Remarks: .....

Inspectors from the Main Office Pass on Each Car Overhauled and Use This Blank

Thus, the first information about a pull-in which comes from the carhouse is in the form of a report made out by the carhouse foreman and signed by the superintendent, master mechanic and manager of the division. This report is sent to the chief engineer and gives the number of the car removed and the cause. To save clerical labor, the fifty-nine most common causes for removals are listed at the top of this blank,

KEY

BODY AND MECH. EQUIPMENT		ELEC. EQUIPMENT—BODY			MOTORS	
1 Damaged	8 S. B. Failure	15 Trolley Wheel or Fork	22 Headlight	29 Misc.	30 Hot Bearings	37 Gear Case
2 Body Defects	9 Catcher or Retriever	16 Trolley Pole or Stand	23 Heater Switch		31 Lead Wires	38 Broken Bolts
3 Register	10 Scrapers	17 Circuit Breaker	24 Misc. Switches		32 Flashing	39 Miscellaneous
4 Brok. Trol. or Reg. Cord	11 Broken Glass	18 Controller	25 Lights Out		33 Arm. Gd. or B. O	
5 Gong	12 Signs	19 Resistance	26 Power Wiring		34 Fields Gd.	
6 Sand Out	13 Fender	20 M. U. Controller or Rev.	27 P. B. Signals		35 B. H. or Yoke	
7 Sand Clogged	14 Miscellaneous	21 M. U. Miscellaneous	28 L't, Heat, Air, Wiring		36 Pin. or Gear	✓ No Trouble Found

NOTE:—Circle, O, around figure Indicates that Removal was Due to Unavoidable Operating Condition and is not Considered a failure or Defect.

Day of Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total Removals Per Car	Mileage
WEATHER																																	
Car No.																																	
865	3							30		30	30				30								30			31							
732																																	

Clerical Work Is Saved on This "Individual Record of Cars Removed from Service" by Using a Code Number for the Kind of Defect

as shown, and all that the carhouse foreman has to do is to check the space indicating the ailment and indicate whether the removal was due to operating conditions or to a mechanical or electrical failure.

After this report is received and noted in the office of the chief engineer, it is sent to the statistical department, which is a part of the auditing department.

From these reports the statistical department tabulates by car numbers on a sheet 20 in. wide by 12 in. high a monthly "individual record of cars removed from service." The upper part of this form is reproduced. As will be seen, it shows at a glance whether the defect for which the car was removed is a chronic one, as would be the case in the example given if, during four days in eight, the car had to be removed for "30," which stands for hot bearings. A copy of this report is laid daily on the desk of the supervisor of repairs, and one is sent to the local master mechanic.

From this report a monthly summary for each carhouse is prepared, totaling the number of defects which have occurred among the fifty-nine varieties of possible causes. This report obviously makes clear whether any undue number of defects of any one kind develop in any carhouse. This report also gives the percentage which the total cars removed from service bears to the total number of cars operated from that carhouse.

Finally, the statistical department prepares a compilation of the relative standing of the carhouses of all the properties on the basis of total defects per 1,000 car-miles. In this table, which is printed in red and blue, a red figure (reproduced in the table in italics) indicates a decrease in defects and a betterment in the relative standing, while a blue figure, reproduced in Roman) shows the opposite. This table is also compiled on the basis of car-miles per defect, as this figure has the advantage of being larger. It is perhaps

STATEMENT SHOWING RELATIVE STANDING IN CARHOUSES OF ALL PROPERTIES, ON THE BASIS OF TOTAL DEFECTS PER THOUSAND CAR-MILES

Relative Standing for 1922							Total Defects per 1,000 Car-Miles		
Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Carhouses	1923	1922	1921
7	4	4	3	1	1	New Britain	0.084	*0.067*	0.159
10	11	14	8	7	2	Middletown	0.130	*0.081*	0.114
21	7	7	11	12	3	Derby	*0.180*	0.585	0.568
12	18	18	18	11	4	Wethersfield	0.195	*0.111*	0.283
3	12	9	6	2	5	Norwalk	*0.207*	*0.213*	0.520
1	1	1	1	16	6	Willimantic	0.210	0.000	2.750
8	9	11	7	6	7	Manchester	0.215	*0.169*	0.217
2	3	6	9	8	8	State Street	0.219	*0.206*	0.257
5	10	3	2	4	9	West Haven	0.225	*0.171*	0.188
14	16	19	19	9	10	Meriden	0.231	*0.214*	0.507
16	8	13	10	10	11	Vernon St.	0.260	*0.198*	0.222
11	15	12	15	13	12	James St.	0.262	*0.088*	0.191
5	14	8	5	5	13	Milldale	0.295	*0.151*	0.555
22	21	10	21	15	14	Dayville	0.314	0.266	0.181
19	20	17	13	14	15	Grand Ave.	0.319	0.300	0.255
5	5	2	17	17	16	Stamford	0.328	*0.142*	0.482
18	19	20	20	19	17	Torrington	*0.417*	0.750	0.437
19	6	23	22	18	18	Congress St.	0.515	*0.410*	0.730
7	6	15	4	3	19	Montauk Ave.	0.548	0.136	0.057
20	22	21	16	21	20	East St.	0.657	0.440	0.347
23	23	24	23	23	21	Waterbury	0.734	*0.277*	0.414
4	13	5	12	20	22	Greenville	0.789	*0.059*	0.204
24	24	22	24	24	23	No. Bennington	1.335	0.545	0.190
13	17	16	14	22	24	Zylonite	1.445	*0.723*	1.111

Italic figures indicate decrease in defects and betterments in standing.

THE CONNECTICUT COMPANY

Engineering Department

SPECIFICATION NO. 629-21621.
COVERING
MILEAGE INSPECTION

This specification is intended to cover a systematic inspection of railway equipment after it has made a definite number of miles, and outline a definite program of inspection to meet the average conditions on the different divisions.

With this in view the following systematic inspection of railway equipment should be followed as far as practical:

Service—Interurban..Every1,500 miles.
Service—City.....Every 1,000 miles.

1. Run the cars into the inspection shed and carefully examine their mechanical details, such as trucks, brakes, air piping, etc.

2. Inspect the electrical equipment, wiring, etc., and check for grounds and faulty operation.

3. Motors, controllers, switch groups and all auxiliary apparatus should be cleaned thoroughly by means of dry compressed air.

4. Necessary repairs to the car body and the details of the car should be made.

5. All wearing parts of the equipment such as bearings, commutators, brush-holders, carbons, trolley wheels, control contact tips, and drum rings should be overhauled and put in smooth running condition.

6. Gears, pinions, wheels, axles, trucks and brake details should be inspected and all worn or broken parts repaired or renewed.

7. Examine the arc chutes, electrical insulation and the car wiring, to see that they are in safe operating condition.

8. All covers on electrical apparatus and on motor bearings and journal boxes should be made to fit tightly, so as to keep out dust, snow and water.

9. Tighten all bolts on motors, gear cases, trucks, etc., and make all necessary repairs so that the cars will leave the inspection shed in such condition that they will require no further attention (other than that which is provided for by Specification No. 628-21621, daily inspection) until the next mileage inspection period.

10. Cars should be oiled on this inspection where possible and if it coincides with the general lubricating schedule. If, however, the general lubricating schedule does not coincide with the date on which the inspection under this specification is made the lubrication of the car should be very thoroughly gone over and if there is any doubt as to its ability to operate until the regular schedule date for lubrication the car should be oiled when this inspection is made.

11. Cars with bumpers, trolley poles, and other black iron work in rusty or dingy condition to have such iron work thoroughly scrubbed and cleaned and a coat of quick-drying black paint to be applied.

12. All mileage inspection shall be made in connection with Form E-215, "Car Inspection Report," which shall be signed by parties making inspection, approved by the foreman in charge, and then permanently filed in the office of the Master Mechanic.

[*Signed*] H. W. BEEBE,
Supervisor of Equipment.

Approved:
[*Signed*] P. W. RIPPLE,
Chief Engr. Power and Equipment.

THE CONNECTICUT COMPANY

Engineering Department

SPECIFICATION NO. 628-21621.
COVERING
DAILY OR CASUAL INSPECTION OF ROLLING EQUIPMENT

This specification is intended to cover daily or nightly inspection which should be given all equipment which is in service where possible and should consist of inspection of brake rigging, shoes and minor defects of cars and equipment reported by crews, such as broken glass, faulty door, bad trolley wheels, hot bearings, defective wiring, loose electrical contacts, faulty control operation, and on such of the older type motors as require it, oiling, etc.

This specification should also provide for the cars being swept out, dusted, and that their appearance and cleanliness are satisfactory for service.

Every car in service is to have this casual inspection made every day if possible, simply to determine if the car is in safe condition, clean, and satisfactory for operation. The general and thorough inspection should be made on a mileage basis, as covered by Specification No. 629-21621, dated Feb. 16, 1921, or such other specifications as may supersede them in the future.

[*Signed*] H. W. BEEBE,
Supervisor of Equipment.

Approved:
[*Signed*] P. W. RIPPLE,
Chief Engr. Power and Equipment.

also in more common use than its reciprocal, or a multiple of its reciprocal.

Other Records Are Kept

A great many of the records of the mechanical department are kept in the form of charts. Among them the following have proved especially convenient:

Cost of maintenance in dollars per 1,000 car-miles for each division.
Number of pull-ins per 1,000 car-miles for each division.
Number of defects per 1,000 car-miles for each division.
Number of hot hearings per month for each division.
Cost of lubrication for each division and each carhouse.
Cost of overhead maintenance (covering accounts Nos. 17, 18, 20 and 22) per month in dollars per mile of track operated.
Number of signal boxes installed and number of interruptions per signal box per month.
Kilowatt-hours output total and per car-mile, monthly, for each division.
Number of track switch interruptions per month and total number of track switches on the system.
Number of trolley wire breaks per month, per mile of single track.

The company also keeps in tabular form, among other data:

Number of armatures rewound per month, showing type of motor, number of miles made between rewindings, etc.
Average weekly wage of the shop men.
Number of shop and carhouse men per car operated, regular, extra, total.
Number of pole renewals per week for each of the different overhead divisions, together with the number of poles behind and the number of poles ahead of the renewal schedule, and the percentage that the division is up to date on its pole renewal schedule.

Veneer Construction Has Advantages

BESIDES permitting the use of cheaper material in the core or on unseen surfaces, veneer construction has several other advantages over solid wood. According to the Forest Products Laboratory, Madison, Wis., these should be borne in mind by the purchaser who thinks that veneering cheapens the product. A panel of this construction has the advantages that it is more nearly of the same strength in all directions and that as it absorbs or gives up moisture it shrinks and swells about as much one way as another. Splitting along the grain in one set of plies is made impossible by the cross grain of the alternate plies, and rapid shrinking across the grain in the face veneers is offset by slow shrinkage along the grain in the core.

Veneered panels do not change dimensions as much as solid wood. Warping is largely eliminated in thick panels by plywood construction. More care can be taken in the selection of surface wood in veneered products than can be taken in solid products. The manufacturer can dry veneer stock very quickly and cheaply, and he can utilize all of his wood to the best advantage.

Glued joints when correctly made are as strong as the wood under ordinary service conditions. Many failures in glued-up wood are caused by "starved" joints, or joints in which the film of glue between the wood surfaces is not continuous. Such joints are not necessarily the result of a lack of glue spread on the wood. Heavy spreads are as likely to produce them under ordinary commercial conditions as light spreads. They are caused rather by the application of pressure to the joint while the glue is too fluid. Starved joints are more likely to occur with glues of low viscosity, such as warm animal glue and most blood albumin glues, than with casein, vegetable and other thick glues.

Some woods are more susceptible to the production of starved joints than others. Birch, maple, red oak, and ash, which have open pores, absorb glue from the spread in such considerable amounts that they often leave the joints starved. Basswood and yellow poplar also take up a great deal of glue, but weak joints are not very noticeable in these woods because the woods themselves are weak. Other woods with smaller cells open to the gluing surface do not seem to be so subject to starved joints.

To avoid starved joints it is necessary to mix a glue solution thick or allow it to thicken on the wood from drying or chilling before pressure is applied. When it is necessary to glue under conditions which might produce starved joints, the use of light pressure is advantageous.

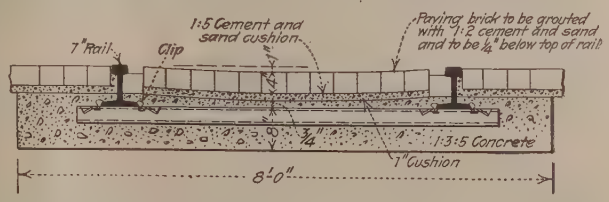
Results with Steel Tie Construction

City and Interurban Railway Produces Pictures and Figures to Show Condition of Track After Twelve Years of Service

By Louis A. Mitchell
Engineer Maintenance of Way, Union Traction Company

DURING the years that steel ties have been in use many articles have been written describing and illustrating the different construction methods and the difficulties encountered in building this type of track. But comparatively little information has been published to show how this type of track construction is standing up. Steel ties have now been in service long enough to make possible an appraisal of their work as part of the track foundation.

The Union Traction Company of Indiana purchased the second order of steel ties manufactured by the International Steel Tie Company in 1911. This type


1:5 Cement and sand cushion
Paving brick to be grouted with 1:2 cement and sand and to be ½" below top of rail
7" Rail
Clip
¾"
1:3:5 Concrete
1" Cushion
8'-0"

Standard Track Construction of the Union Traction Company of Indiana

of tie has been used in reconstruction work ever since. The results obtained on our lines after these years of service leave little doubt as to the merits of steel tie construction.

The accompanying illustrations show examples of this type of construction in Anderson, Muncie, Indianapolis and Newcastle. The joints shown on Meridian Street and on Main Street, Anderson, were built in 1911, and are the oldest tracks that we have with steel ties. Both have been subjected to unusually heavy wear, as is shown by the number of wheel passes in the accompanying table.

An accurate record has been kept of the number and type of cars passing each of the points under consideration. From this it has been possible to calculate the number of wheel passes and the tonnage to which each joint has been subjected.

The other illustrations show joints built at various

times between 1911 and the present date. Other track with steel ties has been built by the Union Traction Company during this period, but that shown is typical. Some has been built each year and the examples pictured are of various ages. None of the track shown, nor any of this type of construction on our property, has cost anything for maintenance since it was installed. These illustrations show what steel tie track will do, and that this type of construction requires a minimum of maintenance.

Users of the International steel tie are probably agreed that it gives the best results when placed in concrete. The track foundation then becomes a reinforced concrete beam in which the wheel loads are transmitted through the rail and the tie. There must be entire and perfect contact between the concrete and the steel reinforcing if the desired results are to be obtained. Where this principle has been closely adhered to there have been no joint failures attributable to the type of construction.

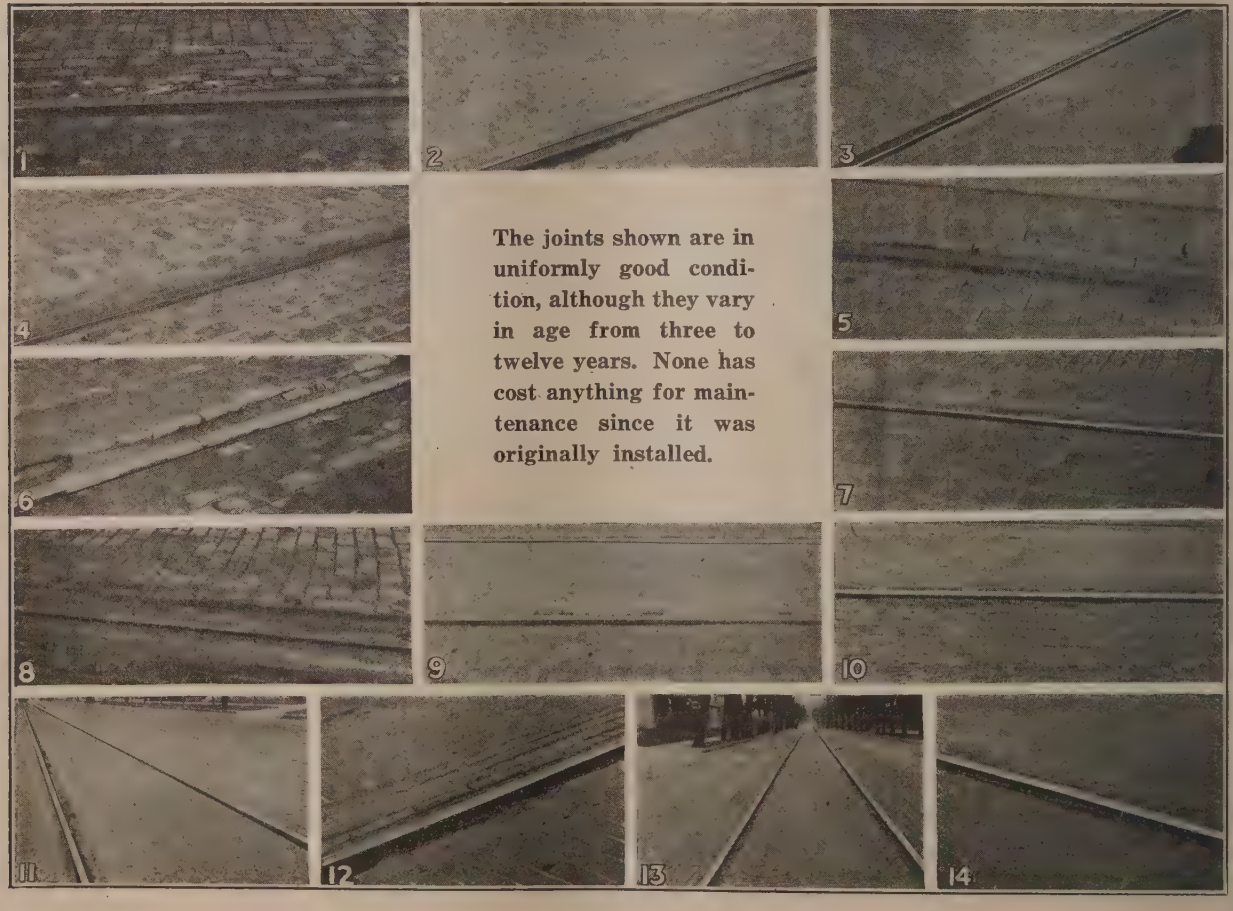
The standard all-steel track construction of this company is with 7-in. 91-lb. girder rail. A foundation of 8 in. of concrete is placed below the tie. Each joint has a steel tie under it, and plain joint bars bolted with six 1⅛-in. machine bolts, driving fit. Each pair of twin ties is placed 3 ft. from the adjacent pair, thus giving an even spacing of ties throughout.

An unusual feature of the construction is that the paving between the rails is slightly concave, insuring the collection of moisture in the hollow in the center of the track. The hollow is drained at intervals by connection to an underground pipe. This construction is useful in keeping water from entering between the rail and paving.

DATA OF CAR AND WHEEL PASSES PER JOINT

Illustration Number	Location	Year Built	No. Cars Passed: Interurban	No. Cars Passed: City	No. Wheels Passed per Joint	Total Weights in Tons: Average per Wheel	Total Weights in Tons: Per Joint
1	Meridian St., Anderson	1911	268,800	957,840	2,990,880	4.5	13,458,960
2	Main St., Anderson						
3	So. Meridian St., Anderson	1916	.....	434,350	868,700	4.25	3,691,975
4	Third St., Anderson	1917	.....	153,300	306,600	4.25	1,303,050
5	East Lynn St., Anderson	1918	.....	306,600	613,200	4.25	2,606,100
6	Howard St., Muncie	1911	144,540	621,960	1,822,080	4.5	8,199,360
7	So. Walnut St., Muncie	1912	104,390	546,040	1,509,640	4.5	6,793,380
8	So. Walnut St., Muncie	1913	94,900	.....	359,600	5.0	1,798,000
9	College Ave., Indianapolis	1912	251,910	134,320	1,544,920	4.2	6,488,664
10 & 11	College Ave., Indianapolis	1917	130,152	134,320	1,057,888	3.8	4,019,974
12 & 13	Twelfth St., Newcastle	1913	109,500	.....	438,000	5.0	2,190,000
14	College Ave., Indianapolis	1920	.....	.....	.....	...	...

The material used for ballast and paving in the standard construction of this company, per linear foot of track, has been calculated as follows: 35.52 paving bricks; for the cement grout, 0.0105 cu.yd. of sand and 0.0355 bbl. of cement; for the sand cushions, 0.032 bbl. of cement and 0.0236 cu.yd. of sand; for the concrete ballast, 0.2536 bbl. of cement, 0.1155 cu.yd. of sand, and 0.1915 cu.yd. of gravel.



The joints shown are in uniformly good condition, although they vary in age from three to twelve years. None has cost anything for maintenance since it was originally installed.

Equipment Maintenance Notes

A Safe High Ladder for the Shop

IN THE overhauling shop of the Chattanooga Railway & Light Company, Chattanooga, Tenn., an ingenious substitute for the ordinary extension ladder is used in connection with operations such as the oiling of hoist trolleys, etc., which require high climbing.

This is a collapsible structure made of two 16-ft. ladders 18 in. wide and one 10-ft. ladder 14 in. wide, put together as shown in the accompanying illustration.

Where Overhead Work Is to Be Done in the Shop a Ladder Like This Should Prove Useful

This picture, taken in the shop of the Chattanooga Railway & Light Company, shows in the foreground the motor-compressor which supplies air for shop uses.

The two large ladders are held together at the top by means of a strap hinge on each side, the ends being spaced sufficiently wide apart to permit the smaller ladder to slide between them. The width of the base of each large ladder is increased by means of a braced strut attached firmly on each side, widening the base to about 6 ft. A pair of steel folding braces attached to the sides of the ladders about one-third of the way up from the bottom permit the two ladders to be stretched apart about 8 ft. to form a stable footing.

The smaller ladder hangs between the upper ends of the big ones on steel straps hooked under the bottom round of the small ladder and over a pair of rounds of the large ladders, depending upon the height of extension desired.

This self-supporting extension ladder is amply substantial, although light, and workmen use it with entire confidence from the standpoint of safety.

A Folding Welding Room

WELDING rooms should be so located that work can be handled conveniently and without the necessity for transporting the equipment to be welded over long distances. Sometimes little space is available in the most desirable location, but this difficulty has been overcome at the Fairview shops of the Lehigh Valley Transit Company, Allentown, Pa., by the plan shown in the accompanying illustration.

The space used for welding is surrounded by a canvas curtain mounted on a ½-in. pipe framework. This framework is hinged at the wall, and a rope attached to the center of the front side and passing over a pulley on the wall permits the raising and lowering of the framework with the canvas. By this method space occupied by a track is used for welding work, and whenever it is necessary to operate cars over the track the curtain is folded back to give clearance. Two rooms of this nature are provided at the Fairview shops, one for acetylene welding and the other for electric welding.

Folding Curtain for Screening Welding Operations

Pit Jack Made from Air Brake Cylinders

THE increasing use which is being made of air in the performing of mechanical operations around electric railway shops is indicated by the larger number of manufactured and locally built devices everywhere in evidence. A pit jack which was put together in the overhauling shop of the Terre Haute Traction & Light Company, Terre Haute, Ind., illustrates this tendency.

This Pit Jack and Transfer Truck Are Used in Connection with Compressor Maintenance in Terre Haute

It consists of two air-brake cylinders, mounted one above the other to give the desired lifting range. The lower one is bolted to the platform of a small truck. The upper cylinder is clamped down on the lower by means of long bolts which pass through a plate on top of the upper cylinder and down below the upper flange of the lower cylinder. The plate serves as a closed end for the upper cylinder and also as a bearing for the plunger or piston rod. On the top of the rod is a

small table (not visible in the picture) on which compressors are lowered from a car body and transported to the overhauling bench.

The air cylinders are held firmly in place by means of four flat steel braces which are bolted to the truck floor as shown. The air pipe leading to the bottom of the lower cylinder is supported by a brace also fastened to the truck floor.

The truck rolls on a cross track, the car from which a compressor is to be removed or on which one is to be placed being "spotted" at the proper point over the jack.

An Almost Frictionless Air Hoist Rigging

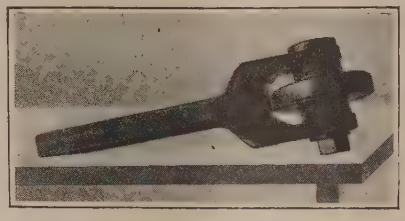
A SUCCESSFUL plan for supporting air hoists in such a manner that they can be moved freely in any direction is one in use in the overhauling shop of the Columbus Railway, Power & Light Company, Columbus, Ohio. It involves the use of two circular trolley tracks of I-section, mounted side by side under the roof trusses, the two together practically covering the shop width.

Two radius bars, also of I-section, travel around each circle, one end of each bar being carried on the circular track by means of a trolley, the other end being pivoted at the center of the circle. An air hoist is suspended from each radius bar on a trolley similar to the one previously mentioned.

At first a roller trolley of the type common in the electric railway shops was used on this hoist mounting, but was found to work stiffly on the circular track. The Chisholm-Moore roller bearing trolley shown in the illustration was recently substituted for it, and has proved well adapted to running on the curved track. The mounting is now practically frictionless.

Lathe Tool for Rolling Journals

LIKE many other electric railways, the Indianapolis Street Railway has found the rolling of axle and other journals to be a satisfactory procedure in the shops. The design



Any Good Toolmaker Can Reproduce This Convenient Device for Rolling Axle and Other Journals

of the rolling tool differs with the ideas of the master mechanics on different properties, but all will agree that the one illustrated above is a good design. At least it has been found so in Indianapolis.

The roller in this lathe tool is about 3 in. in diameter, and ½ in. wide across the face. It is made of tool steel, hardened and highly polished. The rolling surface is rounded at the edges, one side being given a sharper curvature than the other, so as to provide a variety of curvatures. On each end of the roller hub a circular raceway is turned as part of a ball bearing.

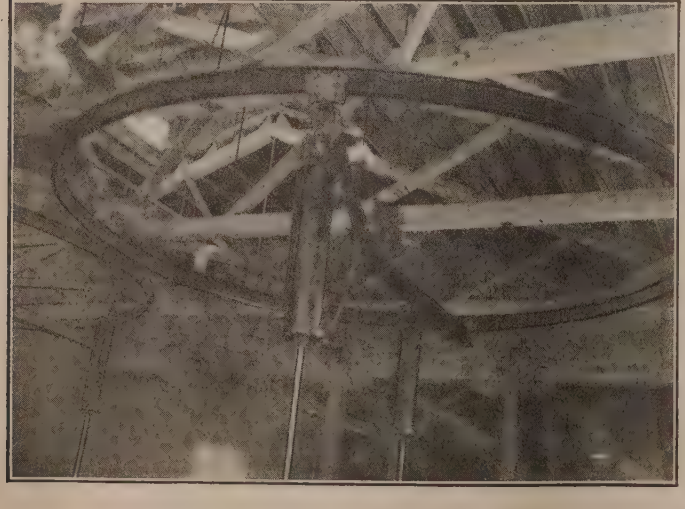
The roller is mounted in a steel holder of which one end is a shank to fit into the lathe toolpost and the other is forked to straddle the roller. A steel arbor passes through the tines of the fork and carries a pair of stationary ball-raceways. The balls which run in the raceways are about ⅛ in. in diameter.

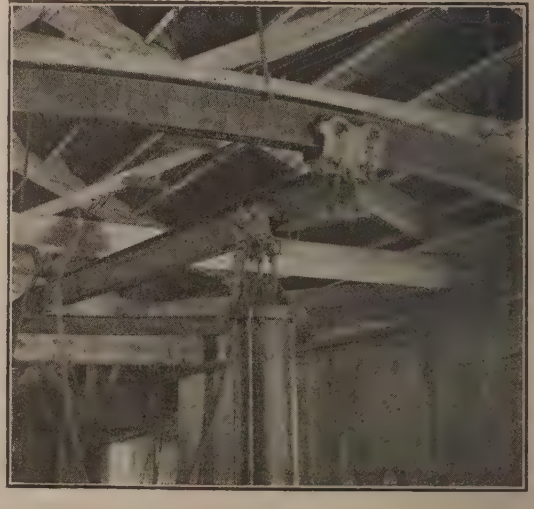
The characteristics of this tool which commend it are its simplicity, the frictionless mounting of the roller and the ease of adjustment of the bearings. As to the rolling of journals as an everyday proposition, J. F. Elward, master mechanic of the Indianapolis Street Railway, is enthusiastic for it, claiming that it produces an excellent wearing surface on the journals. In his shop tool marks are not removed by means of emery cloth, but the rollers rolling on a well-oiled journal surface easily eliminate them.

"Gas Turning" Successful at Terre Haute

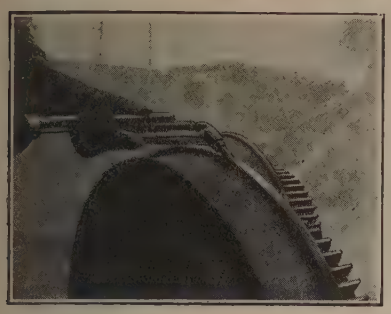
THE Terre Haute Traction & Light Company, Terre Haute, Ind., is getting very satisfactory mileage out of steel wheels. In interurban passenger service 34-in. wheels with rims 2½ in. thick and 3-in. treads are giving well over 350,000 miles on the average. Some 36-in. wheels have made more than 400,000 miles. The wheels used are of the three-wear type, but they are not lathe-turned. Instead a "thick flange" is cut down by means of an acetylene torch, while a thin flange is built up with the electric welder.

The operation of cutting down a thick flange with the torch might properly be termed "gas turning," because when the torch is held in





An Air Hoist Hung in This Way Can Be Moved Freely in Any Direction
At left—General view of hoist mounting. At right—Close-up view of trolleys.



Rectifying Wheel Contour with the Aid of the Acetylene Torch

The torch is held like a lathe tool and the wheel is revolved slowly. Removal from the truck is not necessary.

the position shown in the accompanying illustration and the wheel is turned slowly the excess metal is taken off cleanly. In fact, the torch acts just like a cutting tool and it is remarkable what a smoot surface is left after the operation. The thin flanges are built up with "rail-ox" steel, which gives a fiine, hard flange surface.

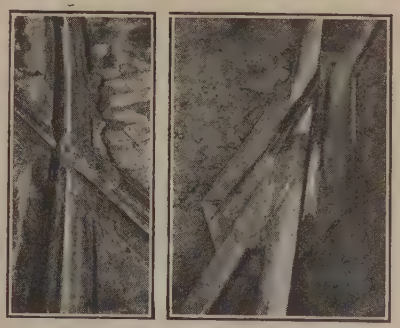
This is no experiment at Terre Haute, as it has been in use for many months and most of the steel wheels in interurban service as well as the smaller steel wheels used on the safety cars in the city have been treated by this process. The reason for the securing of such large mileage is that the metal ordinarily turned off to give a desired flange contour here is utilized in wheel service.

In general the action of the brakeshoes is sufficient to smooth out the contour of both cut-down and built-up flanges, but occasionally emery brakeshoes are used to facilitate this.

The cost of the gas torch operation and the building up of the flanges is between three and four dollars per wheel, including labor and materials and the removal of the truck and replacement under the car. The work is done on two wheels simultaneously without removal of the wheels from the trucks.

Cast Steel Used in Making Special Trackwork

THE accompanying illustrations show some frogs made in the shops of the Lehigh Valley Transit Company, Allentown, Pa., by use of cast steel from its electric furnace. In the construction of the frogs standard rail sections are used. These are cut to shape with the acetylene torch. The edges are then welded at spots, to hold them in position, and a steel plate is placed underneath. When thus assembled, the frogs are placed on a layer of sand on the foundry floor and a mold box is built around the various sections. Molten steel from the electric furnace is next poured in to make the section desired, and finally the grooves are ground out.



Good Service from Cast-Steel Frogs

The frog at the left, which is held together with cast steel, has been in service two and one-quarter years.

At the right is shown a cast-steel frog at Central Park, Allentown, Pa., in service one and one-half years.

One of the frogs illustrated has been in service two and one-quarter years at a point of heavy traffic at the corner of Seventeenth and Turner Streets, in Allentown. The frog in the second illustration has been in service about a year and a half. Sixteen frogs of this design are now in service in Allentown. The company finds that this method of building up frogs eliminates all loose centers, which are a frequent source of trouble.

Finding a Solution for the Pull-In Problem

General Manager, Dissatisfied with Record Made By Local Company, Puts Matter Squarely Up to Department Heads—Calls for Quick Results

WM. REDFIELD, general manager of the Jinxville Electric Railway, is of a cheerful disposition, but his face wore a forbidding frown last Monday morning as he studied the record of car pull-ins for the preceding week. "The place for a car is on the street, giving service," he muttered, "not in the barn, laid up for repairs. We've got to do something about this." Then calling Riter, his clerk, he said sharply, "Charlie, ask Gainway, the superintendent; Jones, the machine shop foreman, and Fairweather, the roadmaster, to come here for a short conference."

"What's wrong, chief," said Bill Jones, the first arrival as he caught the frown on Redfield's face. "Nobody sick at home, I hope."

"No, they're all well enough; but it's this pull-in record that bothers me. A pull-in last week for every 2,000 car-miles. No wonder the barn is full and we have trouble in maintaining our schedules."

"A lot of them don't mean anything, Chief; our motormen often pull in a car just because they don't like it. The inspector reports it 'O.K.' and it goes right out again. Here's Gainway, he can tell you about it."

"Talkin' about pull-ins? Well, there are too many of them, but they are mostly for trifles," replied Gainway. "A worn motor brush, loose controller finger or tight brakes. If you fellows in the shop did your work right they wouldn't happen."

All of the men whom he called having arrived, Mr. Redfield put up to them what they could do to improve the pull-in record. "Do you know," he said, "I heard the other day about a road that makes over 20,000 miles per pull-in, ten times as good a record as ours?"

"That's some record, Mr. Redfield," said Gainway, "it looks queer to me. Maybe they can do it; maybe they can't. And a big mileage per pull-in doesn't mean a correspondingly low maintenance cost, either. Of course, I'm not arguing that a good pull-in record isn't a good thing. It is, all right, but that's not the whole story."

"I agree with you, Bill," said the G. M., "but all the same I think we can do better."

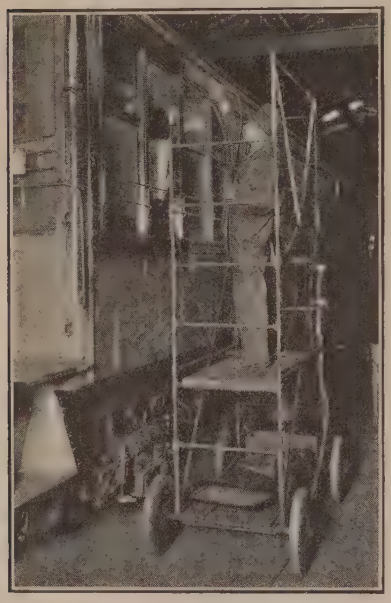
"That reminds me, Mr. Redfield," said Jones, "that I heard of a car barn where they allow each inspector a bogie of a certain number of pull-ins per month for the part of the equipment he looks after. They post the record every month. The same road, I understand, sends out a repairman to fix little troubles on the road. Not a bad idea, I'll say."

"What you fellows say shows the need for all the departments to pull together instead of passing the buck all the time," said Redfield. "It's purely a co-operative proposition.

"Get your heads together, fellows, and see if you can't get control of this pull-in business. When I took charge here late last year you promised to help me get this property into a condition such that we could show a little profit for 1923. Here's one way you can help. Meet me here at the same time next Monday and show me some results. Do you get me?"

Movable Platform for Spray Painting

THE accompanying illustration shows a pipe-work platform mounted on wheels, which is used for spray painting at the Thirty-ninth Street shops of the New York Rapid Transit Corporation. This platform is built of ⅜-in. and ½-in. pipe and has a ladder construction at each end. Planking is arranged to fit in and can be supported at the various rungs of the end ladders. With the exception of two pipes forming an X and a cross-support, the front side is open so as not to interfere with the work of the painter. The entire scaffolding is mounted on four sheet-iron wheels. These are welded and give a very light construction. The tank for paint spraying and the necessary valves are mounted at the end of the pipe framework.



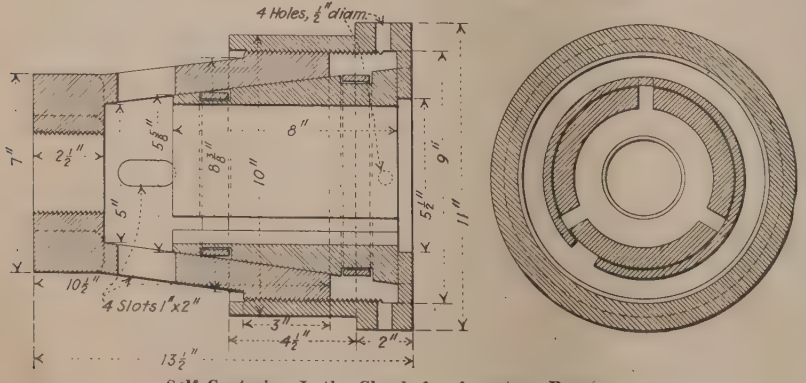
Convenient Pipe Scaffolding Mounted on Wheels for Spray Painting

In working the painter starts at one end of the car and pushes the scaffolding along as he progresses. It is thus unnecessary for him to get off the scaffolding until he has completed the strip of the side of the car that he is working on. At the shops of this New York company, the general practice is to paint the sides from the roof down to below the windows from one position of the scaffolding. The part of the car body below the windows is painted from the shop floor, and the roofs are painted by placing the boards on which the painter stands on a higher support of the pipe framework.

Handy Armature Bearing Chuck

A SELF-CENTERING chuck that is a time and labor saver is used in the shops of the International Railway, Buffalo, N. Y., for holding armature bearings while they are being machined. This chuck consists of a taper housing with collapsing split sleeve. The International Railway uses five sizes of these sleeves to accommodate the different sized bearings. These have inside dimensions varying by ½ in. from 3 in. to 5 in. The sleeve is split into three parts and is held together by two ¼-in. x 1-in. steel rings. By screwing the front portion of the chuck the split sleeve is forced inward against the taper of the housing and thus clamps the bearing and at the same time centers it.

The chuck is threaded at the back end, so as to screw on to the headstock of the lathe. Four slots 1 in. x 2 in. in size are provided for tightening the chucks, and these slots also serve as an outlet for the babbitt chips when the bearing is being machined. The tool post is fitted with three tools, one for turning large bearings, one for small bearings and a third for facing the ends of bearings.

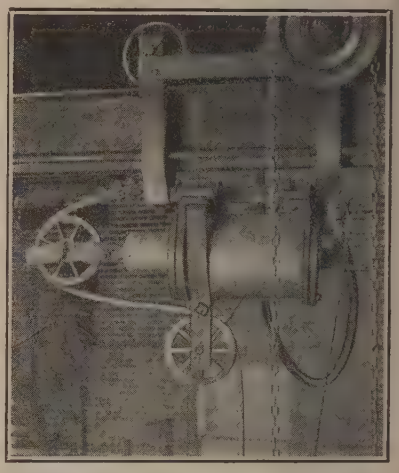


Self-Centering Lathe Chuck for Armature Bearings

Air Hoist Made from Air Brake Cylinder

AMONG the many types of hoists which are found in electric railway shops, one of the most interesting is a home-made affair built and used successfully in the machine shop of the Newport News & Hampton Railway, Gas & Electric Company, at Hampton, Va.

An air-brake cylinder is hung from a trolley which runs on the base of an inverted rail suspended possibly 15 ft. from the floor. The plunger carries a grooved sheave mounted in a bearing made of strap iron. Below the cylinder is a second sheave mounted on a strap-iron support as shown in the accompanying illustration.

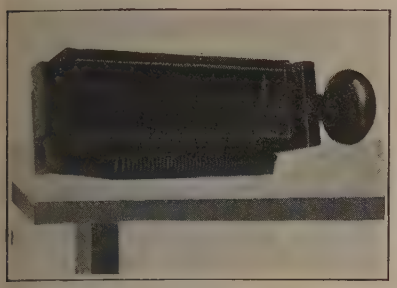


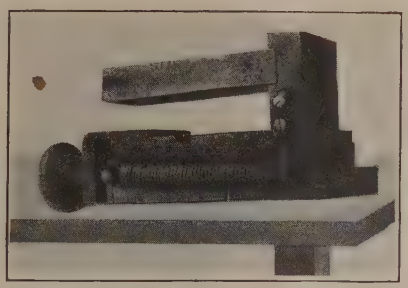
This Simple Air Hoist Is Made Largely of Waste Material

A steel cable is attached to the trolley and passes around the two sheaves in such a way as to permit it to hang below the middle of the trolley. The method of connecting the cable over the two sheaves gives it a lifting range of twice the travel of the plunger.

The trolley is made of 3-in. strap iron, carrying 6-in. rollers. The frame is fabricated so as to permit the cylinder to be mounted under it as under a car. The air hose which feeds the cylinder drops from above in a long loop so as to permit considerable travel of the hoist along the rail. Movement along the rail is controlled from the floor by a chain passing over a sheave mounted on the end of one of the roller axles.

While the range of this device is not large, it serves its purpose as it is used principally for hoisting parts from the floor to a truck. It will raise a half ton a couple of feet without difficulty.





Lathe Tool Used for Grinding Commutators in Indianapolis Street Railway Machine Shop
At Left—Tool in position as used in lathe. At Right—Tool laid on its side to show details of spring connection and shank for mounting in lathe-carriage tool-post.

Grinding Tool for Lathe Insures Good Commutator Finish

IN GRINDING commutators one problem is to insure a uniform pressure of the grinding stone against the commutator surface. This problem has been solved in the shops of the Indianapolis Street Railway by the construction of a lathe tool in which the carborundum block is pressed against the commutator by a spring, in the fashion shown in the accompanying illustration.

The tool consists of two principal parts: One that may be termed the body, to which is attached a shank to fit in the tool post of the lathe, and the other the grinding block holder, a shell in which the grinding block is held by friction, being driven into place.

The block holder slides on the body, being held in proper relation thereto by means of a dovetail mortise and tenon. This arrangement, with the rubbing surfaces properly lubricated, permits the block holder to slide backward and forward, the block holder being pulled outward or toward the commutator by means of a steel spring. A circular handle permits the block to be pulled away from the commutator without disturbing the position of the tool carriage.

Commutators are polished with this tool after they have been undercut.

New Equipment Available

Electric Glue Pot for Railway Shop

THE maintenance of railway equipment includes a number of operations which require heated glue. Realizing that there are many cases where the heating of glue pots by gas or fire may present an extreme fire hazard, the Westinghouse Electric & Manufacturing Company has developed a line of electric glue pots. These may be used for heating materials with low melting point, such as paraffin and beeswax, as well as glue.

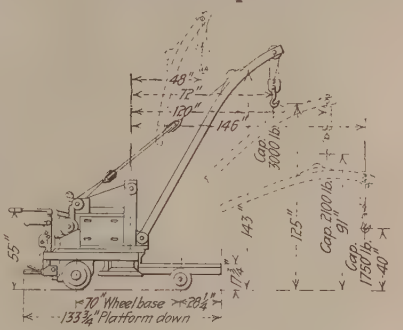
Some of the advantages claimed for the electrically heated pots are that the expense of operation is less than for other types and that they furnish a uniform and reliable heat.

The type of electric glue pot now being marketed can be fitted with rheostatic control to give a wide range of temperature. Through its use it is possible to regulate the heating of the glue so that it will be suitable for the particular type of work being undertaken. Electrically heated pots are portable and thus they can be ready for use wherever the work may be located, as the plug for the extension line can be shifted from one outlet into another.

The Glue Pot Is Portable and Keeps the Temperature Uniform

New Type Crane Truck

A NEW three-way crane truck has been developed by the Baker, R. and L. Company, Cleveland, Ohio, which is of particular interest due to the power swiveling attachment provided. This feature increases the utility of the machine, and enables the driver to operate it with ease. The type DYAQ crane has a capacity at 6-ft. radius of 3,000 lb. It weighs 7,000 lb. without battery and has a travel speed of 6 m.p.h. without load. The hoist is driven by a single totally-inclosed motor of 24-volt 60-amp. rating at 1,000 r.p.m. Power is applied to either drum by means of magnetically operated friction clutches. This makes the change from one drum to the other very smooth, and the construction is such that the drum which is not working is firmly held by a large-sized brake.



Dimensions and Lifting Height of New Three-Way Crane

The slewing unit is pillar mounted and turns on ball bearings. Power is transmitted from the slewing motor through a worm and spur gear. The slewing motor is compound wound, totally inclosed, and has a rating of 24 volts, 32 amp., and 1,700 r.p.m. Control of the slewing motor is by means of a drum-type reversing controller mounted on the dash. Limit switches are provided for automatically controlling the hoisting and reverse motions of the boom, the hoisting motion of the load hoist and slewing motion.

The boom is fabricated from structural steel and can be made to any length which is required within reasonable limits.

The News of the Industry

Shore Line Revived

Line Opened Between New Haven and Guilford After Being Shut Down Four Years

Cars began operation on July 17 between New Haven and Guilford, Conn., on the New Haven & Shore Line Railway, a part of the former Shore Line Electric Railway. The new company, under the direction of William A. Sperry, consulting engineer, New Haven; the Blakeslee Brothers, and others, has purchased that part of the old Shore Line system between New Haven and Saybrook and has rehabilitated the line between New Haven and Guilford. Very little work was required as the original construction was good. The line between Guilford and Saybrook will gradually be opened.

Altogether the new company owns about 35 miles of track, laid with 70-lb. T-rail on ties 2-ft. centers and supplied with a catenary overhead line. A large part of the road is on its own right-of-way. Power for the present is being supplied by the Connecticut Company from station A in New Haven, and until its new cars arrive from the Wason Works the company will use cars leased from the Connecticut Company. The new cars will be double-truck, with a single operator. There is a substation at Guilford and a second one is being built near North Branford. The voltage will be 650.

On July 16 a special party of about 125 took three cars from New Haven as guests of the company. On their trip they found a good deal of rejoicing over the opening on the part of those along the way. At Guilford a collation was served in the carhouse, and speeches were made by Mr. Sperry, Mayor Fitzgerald of New Haven, L. S. Storrs and others. Mr. Sperry also introduced the new general manager, William Walker.

The F. E. Kingston Company, New Haven, is acting as banker in connection with the road. The bond issue is $500,000, of which $400,000 is to be sold, the stock issue being $400,000. New Haven business men and residents of the territory served are among the supporters of the project.

As indicated previously this 33-mile stretch of railway, providing connections from New Haven to Madison, Guilford and Saybrook, was formerly part of the Shore Line Electric Railway and, with lines running to Norwich, Stonington and Westerly, made up a system of 134 miles, part of which has been in disuse for several years.

The new company now operating the road is giving hourly service for the greater part of the day, with more frequent service when the traffic is especially heavy, as during week-ends and holidays. The growing summer resort interests along the route call for such a service, and stone quarries are expected to yield a paying freight business.

Wage Testimony All Presented in Chicago

Presentation of testimony in connection with the arbitration of the wage dispute between the union employees on one side and the Chicago Elevated Railroads and Chicago Surface Lines on the other was completed during the week ended July 14. It was stated that a decision would probably be announced on July 21. The wage scale to be decided by the arbitration board will be for two years, dating back to June 1, the date on which the former wage agreement expired. The arbitration board began hearing testimony on July 9 and daily sessions have been held. The cost of living has been the chief subject of discussion and testimony of witnesses. The men now receive 70 cents an hour. They are demanding an increase of 10 cents an hour.

President Rides in St. Paul Cab

President Harding had the unusual experience of riding in the cab of an electric locomotive of the Chicago, Milwaukee & St. Paul Railway in his recent Western trip. He had as his guide H. B. Earling, Western vice-president of the Chicago, Milwaukee & St. Paul Railway, shown on the pilot of the locomotive in the accompanying engraving. In commenting on his experience the President said that the electrification was the most stupendous undertaking of the kind he had ever seen.

Official Reports on Strike

Industrial Commissioner Who Inquired Into Schenectady Strike Wants Greater Voice for People

Sweeping changes in the present method of managing public utilities in New York State, a direct outgrowth of the strike on the Schenectady Railway, and a reflection as well, of the prolonged Albany strike, are recommended in the report just submitted to Governor Smith by Bernard L. Shientag, State Industrial Commissioner, reviewing the Schenectady situation. Mr. Shientag urges three radical departures from the existing system of managing street railways:

1. Representation of the people of the localities concerned on the directorates of street railways.
2. Legislation that will give the people, who are the most vitally interested, a greater voice in the control and regulation of public utilities.
3. Legislation that will delay strikes until an impartial tribunal has made a public investigation and endeavored to settle controversies between the employees and the companies.

Commissioner Shientag places full responsibility for the Schenectady strike deadlock on the fact that no member of the board of directors of the Schenectady Railway is a resident of Schenectady and that the directors themselves are split fifty-fifty on the proposition of recognition of the union.

The situation on the board of directors, the announcement by Commissioner Shientag said, has driven him to the conclusion that the only remedy against a recurrence of the Schenectady situation is to open a way for a voice of the public in avoiding similar troubles in the future.

From the inquiry conducted in the Schenectady strike situation it developed that the Schenectady Railway was owned jointly by the Delaware & Hudson Railroad and the New York Central Railroad, each of the companies having six representatives on the board of directors. Commissioner Shientag said the New York Central group of directors favored recognition of the union, while the Delaware & Hudson directors refused to recognize the union and would deal with the striking employees only as individuals.

Commissioner Shientag said:

The attitude of the Delaware & Hudson interests in the Schenectady Railway strike is complete denial of the right of collective bargaining. As the situation has developed it is no longer a question of entering into contract with the union, but the question that is presented to us is whether or not the union shall be destroyed.

The present attitude of the management of the company is that there is no strike—that the strike is over. Anyone in the streets of Schenectady will testify to the contrary.

The New York Central Railroad, through its directors represented on the board of

the Schenectady Railway, has taken a progressive stand on some of the questions involved in this strike. Declarations alone, however, will bring no results to a suffering public. The New York Central, being the one-half owner of this property, cannot escape the responsibility which such ownership carries with it. The fact that there is a conflict of views among the directors of the Schenectady Railway can afford but little satisfaction to the people of Schenectady.

The function of the State Department of Labor with reference to a strike or industrial controversy, says Mr. Shientag, is threefold:

1. To attempt to avert the strike before it takes place.
2. To use its endeavors to bring about a settlement of the strike after it does occur.
3. To investigate the causes of the strike and to bring the facts to the attention of the public to the end that the force of enlightened public opinion may succeeed in bringing the parties together where other means have failed.

He then went on to explain that neither the labor department nor any other state agency has any power of compulsion in an industrial dispute, and continued with a brief discussion of the economic effects of a strike.

In making his recommendations to minimize the danger of future strikes, Commissioner Shientag declared that in little more than two years trolley strikes in Albany, Troy, Schenectady and Buffalo have cost the traction companies more than $10,000,000 and caused tremendous losses to the traveling public and to business interests.

The significance of the state's efforts to settle the Schenectady dispute spread beyond the confines of the area affected when Commissioner Shientag called William K. Vanderbilt, director of the New York Central, and Alfred H. Smith and Albert Harris, president and vice-president of the New York Central, and directors of the Schenectady Railway to testify. Their testimony, bearing principally on recognition of the union, attracted wide attention.

In the course of his observations the commissioner said:

To one who has closely observed the progress of events leading to these strikes, and their aftermath, the conviction is inescapable that the citizens of a community should have a greater voice in the control and regulation of their public utilities.

After all, the public attitude determines to a large extent the success or failure of public service corporations, like street railways. If recognition is to be given to the oft-expressed declaration that in a situation of this kind the public interest is paramount, public service corporations may well consider the advisability of having on their boards of directors one or more disinterested persons to represent the people of the community, to reflect their views, to keep the board informed of local conditions and to be in position to foster that spirit of equity and fair dealing between the company and its employees without which neither can prosper.

In the future, such public representation on the directorate may well be written into contracts entered into between public service corporations and local communities involving the use of the public highways. Public representatives on such boards may be in a position to give expression to the public needs and public welfare, frequently lost sight of by both parties in these controversies.

There may well be considered also the advisability of enacting legislation providing that in the event of a declaration of a strike on a public utility it shall not become operative until a short fixed period intervenes, during which time an impartial tribunal shall make a public investigation of the facts and endeavor by mediation to bring about an adjustment of the difficulties.

New Overhead Tested

Large Values of Electric Current Can Be Successfully Collected for Heaviest Traffic Possible

A new type of overhead trolley construction has been developed by the General Electric Company for use on heavy traction electric railways. A demonstration was made on the tracks of the General Electric Company, at Erie, Pa., on July 16, 17 and 18, before a group of railway executives, engineers and operating men. These public trials were for the purpose of showing that the new type of overhead construction can be used successfully for collecting current, either direct or alternating, for handling the heaviest railway traffic that can be anticipated in the future. A new record for current collection of more than 5,000 amp. was set up. This is considerably more than twice the amount of current now collected for normal requirements. It was done at speeds up to nearly 60 m.p.h., the current and speed apparently being limited only by the ability of the power supply.

Test Train Taking Current from New Type of Overhead Construction

The test train was composed of a 110-ton passenger type gearless locomotive, drawing a gondola car and a coach. Two pantographs were used, being of the type which have been employed successfully on the Chicago, Milwaukee & St. Paul electrification. The pressure of the pantograph against the wire was between 30 and 35 lb. The load was supplied by means of grid resistors mounted in the gondola car and controlled through remote-control switches located in the locomotive. By this means any load in addition to that taken by the locomotive could be imposed on the station up to the capacity of the station apparatus.

The length of the track on which the test was made is about 2¾ miles, the greater portion of it being used for high-speed running. The overhead construction is supported by steel bridges for a portion of the way, lattice poles for another section, and poles of I-beam sections remainder of the way. The pole spacings are approximately 300 ft.

The overhead construction is of the compound catenary type. A messenger cable of steel strand is hung from insulators on the supporting bridges or pole brackets. From the messenger cable is suspended a copper feeder messenger cable by means of hangers. Two contact wires are used, for the major portion of the distance being No. 0000 grooved copper trolley wire, the remainder being No. 000000 grooved copper trolley.

The special feature is the method by which the trolley wire is suspended from the feeder messengers. This is accomplished by means of a lacing of copper cable, along the direction of the line, and fastened with clips alternately to the feeder and to one or the other trolley wire. The spacings between clips on one wire vary from 15 to 20 ft., making the clips on the feeder messenger 7½ to 10 ft. apart. By this means great flexibility is obtained.

A number of observation towers were erected at a height approximately that of the top of the pantograph, so that those witnessing the tests could see the action of the pantograph moving along the wire. In the entire series of tests practically no arcing was observed, regardless of the speed or load. A complete description of the installation and the tests made will be published in a future issue.

Men Accept Five per Cent Advance

Employees of the Interborough Rapid Transit Company, New York, N. Y., recently accepted by a majority vote of 1,200 the 5 per cent wage increase offered by the company. The vote was either to accept the 5 per cent increase or else to refer the matter to arbitration. The wages range from $3.50 to $9 and $10 a day for skilled mechanics. The increase will be retroactive to July 1 and will remain in effect for one year.

The men had demanded an increase of 10 per cent. Frank Hedley, president, replied to the demands of the men by offering a 5 per cent increase. He said that even the 5 per cent rise would place an additional burden of $1,250,000 a year on the company.

Predicts 29,000,000 Population in New York in Year 2000

What traffic regulations and methods of transportation will be in force in the year 2000 might well be subjects for conjecture as well as apprehension in view of a recent prediction of the Committee on Plan of New York and Its Environs that in the year 2000 the population of New York would be nearly 29,000,000.

It believes that the negro population will be triple the present quota and that there will be a substantial decrease in the percentage registered in the foreign-born element. This conclusion was reached after a statistical study of the population undertaken by Professors Pearl and Reed of the School of Hygiene and Public Health of Johns Hopkins University.

The area under scrutiny was called the "New York Region" and comprised a territory of more than 5,500 square miles in New York, New Jersey and Connecticut. The present population in that area is roughly estimated at 9,000,000.

The forecast for the area in round figures is as follows:

1930	11,500,000
1940	14,100,000
1950	16,800,000
1960	19,600,000
1970	22,300,000
1980	24,800,000
1990	27,000,000
2000	28,800,000

The scientists in a booklet giving their prediction disclosed in detail the complicated mathematical processes by which they arrived at their results.

F. P. Keppel, secretary of the Committee on Plans of New York and Its Environs, says that it is interesting and significant to note that the forecasts by Professors Pearl and Reed for a considerable period into the future, up to 1970 at least, a limit which provides ample latitude for the present regional planning project, are in quite close agreement with those worked out by Nelson P. Lewis as a part of his physical survey of the region for the committee, as well as those made by at least one important public service corporation.

No Increase in Philadelphia This Year

According to a plan recently advanced by Thomas E. Mitten, chairman of the executive committee of the Philadelphia Rapid Transit Company, any excess wages to employees over the present 64-cent scale are to be diverted to the co-operative wage fund. The present wage of the Philadelphia Rapid Transit Company is based on the average of three cities, namely, Chicago, Detroit and Cleveland. Negotiations are pending in Chicago and Detroit looking toward an advance in wages and it is the intention of the Philadelphia company to keep the cash payment to its men constant by the new plan. Following the announcement by President Mitten, a resolution was adopted by the co-operative committee authorizing the company to pay any additional wages to which the men may become entitled this year into the co-operative dividend fund. It was Mr. Mitten's contention that the company could not meet another advance this year and continue the 10 per cent co-operative wage dividend.

$78,000,000 Transit Program

United Recommendations Are Made in Philadelphia for Carrying Out Work in Business Area

The engineers for the city of Philadelphia, the Philadelphia Rapid Transit Company and the business interests in the center of the retail shopping district united on July 10 upon a recommendation to the Council's Transit Commission. The recommendation as explained in the official statement and as commented upon in the *Ledger* was in two parts: First, a broad and comprehensive plan for high-speed transit development based on present needs and upon those that will undoubtedly be created by the completion of the Delaware River bridge and the possible changes in the terminal of the Pennsylvania Railroad Company, and, second, the first step for construction.

BROAD STREET PLAN UNCHANGED

Taking up the latter, "step No. 1," as of immediate importance, the engineers propose the building of the Broad Street subway substantially as planned in the program of 1914-1916, between Olney Avenue on the north and Spruce Street on the south, but with Director Twining's proposal for a subway beginning at Broad Street and Ridge Avenue, extending under the Ridge and Eighth Street to Walnut, and thence westward to a connection with an elevated line on Woodland Avenue to Darby.

"Step No. 1" forms the heart of the program, but the comprehensive plan shows also—for ultimate construction—a surface-subway under Chestnut Street, connecting on the east with the ferries and with the bridge, and on the west gathering in the surface lines now operated on Spruce Street and on Baltimore and Chester Avenues; a subway under Arch Street, with a possible future connection by tunnel with Camden and connecting with an elevated line on Lancaster Avenue to Overbrook, and a subway under Filbert Street connecting with the bridge, at the east, and with the Parkway-Roxborough line at the west.

The engineers in their report estimate the cost for construction and equipment under "step No. 1" at $78,000,000, of which sum about $31,000,000 is or can be made immediately available out of the loans already authorized. It is understood that the city's unused debt limit will permit the borrowing of the additional amounts needed to carry through this initial unit.

Canadian Pacific Electrification Rumored Again

Plans for the electrification of the Canadian Pacific Railway's main line through the Rocky Mountains, or, at least, those sections where the existing grades are heavy, are expected to materialize in the very near future. Officials of the railway are discussing these plans at present, and from information given out it is confidently expected that work on the electrification will be started next year.

D. C. Coleman, vice-president of the Western lines, stated a few days ago that surveys on the water power available on the Columbia River in the vicinity of the main line are now being carried out by the company. At present there are observers determining the water power at Surprise Rapids on the Columbia River, about 32 miles south of Beavermouth. Mr. Coleman stated that for the time being the surveys were being confined to the water of the Columbia River. Mr. Coleman said traffic demands, the financial situation and other conditions would of course determine largely when a start would be made.

Safety Committee Dines and Hears About Safety Progress

Fried chicken was served to 100 employees on safety committees of the Union Traction Company of Indiana at the semi-annual dinner held recently at Anderson. A feature of the dinner was the announcement by Ross Luellen, safety engineer of the company, of the company's record for four years, during which time its cars hauled 66,800,000 persons and its interurban and city trains have traveled a total distance of 31,500,000 miles with no passengers killed.

Steam railroad crossings at grade were safely passed 11,000,000 times and there were 1,250,000 safe "meets" in sidings in interurban operation. Two billion pounds of freight and express were transported on the company's lines in these four years.

"Safety First" in Anderson has made real progress through the efforts of Mr. Luellen, who keeps before the people the subject of safety through the "Sayings of Safety Sam" and through his various addresses before the Rotarians, Kiwanians, school children, etc. He believes that each person's safety, whether physical, moral or financial, depends first and most of all on the precautions which he himself takes.

Brooklyn Elevated Case Adjourned

The hearing of Edwin Parcells, Brooklyn motorman of the Fifth Avenue Elevated train which fell from the elevated structure at Flatbush and Atlantic Avenues on June 25, was adjourned on July 17 in the Flatbush Court until July 31, to await the result of the various investigations now pending.

New York City Creates a Transit Bureau of Its Own

A permanent Transit Bureau with an appropriation of $101,700 was created by the Board of Estimate of New York City at its meeting on July 13 on motion of Mayor Hylan. All special committees acting for the board in transit matters will be discharged as soon as they report and their place will be taken by the new body, which consists of John H. Delaney, Dock Commissioner; George P. Nicholson, Corporation Counsel, and Arthur S. Tuttle, chief engineer of the board.

Mr. Delaney, as chairman of the special committee negotiating on new subways with the Transit Commission, presented a report recommending that the board approve and adopt the major portion of the commission's route for the proposed Brooklyn-Queens crosstown subway. The report also asked for sixty days extension of time for the committee's consideration of the rest of the crosstown subway and of the proposed west side subway in Manhattan. Mr. Delaney indicated that the negotiations with the commission were proceeding amicably and toward a solution of the present deadlock. The board did not act on any of the report, but extended the time of the committee for sixty days.

The new Transit Bureau received jurisdiction over all transit affairs. Among the matters which it is empowered to handle are negotiations with the Transit Commission, discussion of new routes, appropriations for the state body, and preparation of the local city administration's plans for providing new subways.

The new Transit Bureau received its first assignment when the board referred to it the problem of continuing the operation of the trolley lines of the Manhattan & Queens Traction Corporation, whose contract was declared forfeited, because of alleged failure to furnish the stipulated service. Pending the taking over and operation of the lines by Grover A. Whalen, Commissioner of Plant and Structures, the transit committee will see that there is no interruption of service. Counsel for the receiver of the line protested against the board's action, and threatened to take the matter into the courts.

Specialists to Report on New York Elevated Equipment

Frank Hedley, president of the Interborough Rapid Transit Company, and W. S. Menden, president of the Brooklyn-Manhattan Transit Corporation, have informed the Transit Commission that they have arranged with the General Electric Company and Westinghouse Electric & Manufacturing Company to carry out a suggestion of the commission to have engineers of those companies make a thorough survey of the subway and elevated equipment and of its maintenance. Letters from the companies to this effect were made public by Commissioner Harkness on July 12. He said:

> These letters from Mr. Hedley and Mr. Menden carry out suggestions made by the Transit Commission several weeks ago. They were made before the recent Fifth Avenue (Brooklyn) accident. The purpose of the survey is to supplement inspection of the commission's regular staff through an examination by engineers of the two companies. Their report will give us most exact and authoritative information as to present condition of the equipment used in subways and on elevated lines.

Cicero Has Peculiar Problem

Seeming Lack of Responsibility for Paving Reacts Against Railway and the Public

The Cicero Avenue line of the Chicago Surface Lines operates between Irving Park Boulevard and Twenty-fifth Street. The major portion of the line is within the city limits of Chicago, but a stretch of double track 1¼ miles long, between Twelfth Street and the southern end of the route, lies in the town of Cicero. This section has received no attention other than the ordinary maintenance necessary to operate cars for a number of years. The street on each side has recently been paved by the town, but the section of roadway maintained by the railway has remained unpaved. It is at a grade 5 in. lower than the new pavement.

View Showing Condition of Street on Either Side of Tracks

No one lays claim to this particular piece of property and yet it furnishes transportation to a major portion of the 20,000 employees of the Western Electric Company and during the rush hour is one of the heaviest cross-town lines in the city.

A number of years ago an ordinance was passed by the city of Chicago and the town of Cicero authorizing the Chicago Railways, which originally built the track, to enter into an operating agreement with the Chicago & West Towns Railway whereby it would be possible for the Surface Lines to operate its cars over the 1½-mile stretch in the town of Cicero, the only requirement being that the Chicago Railways should maintain the track in good order.

The ordinance, however, stipulated that the company could not pay for rehabilitation work, the only allowable expenditure being that necessary to keep the track in operating condition. A 30-day cancellation clause was included in the operating agreement between the two railways.

No trouble was encountered during the ensuing years until one year ago, when the town of Cicero let the contract for paving this street on each side of the right-of-way, and raised the grade 5 in. above that of the track. The town of Cicero called upon the Chicago Railways to raise the track to grade and pave the property. It was pointed out to the town officials that by the ordinance the railway was prohibited from making any expenditure of this nature. The West Towns Railway declined to do anything, stating it was not using the track and had no objections to its being torn up. The Illinois Commerce Commission was asked to force the Chicago Railways to pave the street, but after reviewing the ordinances and the operating agreement, the commission declined to issue an order.

No further action has been taken by the town of Cicero and the condition prevailing now as to clearances permits only certain types of cars to be run over this stretch of track. Although operation may be continued during the summer and the open months of the year, it is doubtful if it can be continued during the coming winter when this sunken area will become filled with water and snow and may freeze over.

Discontinuance of the service at Twelfth Street, the city limits, will mean discommoding a large part of the employees of the Western Electric Company, which is located 1 mile farther south, who use the Cicero Avenue line as a means of getting to and from work. The adjoining pavement is already being affected by the different grade due to the heavy trucks turning in and out and breaking down the concrete.

It certainly appears as though the town of Cicero has been very shortsighted in paving before a disposition was made in regard to the paving of the tracks. With the thirty-day cancellation clause written into the agreement and the ordinances as previously stated, the railway company is not allowed under these conditions to write into its capital account an expenditure for this paving.

Deadlock in Jersey

Public Service Railway Flatly Refuses Demands for Higher Wages and Shorter Hours

After six weeks of silence, the Public Service Railway, Newark, has answered the demands presented by the men on June 1. In a statement made on July 17 to the general conference board representing the employees, Thomas N. McCarter, president of the company, said that the financial condition of the railway made it absolutely impossible to grant any increase in the wage scale at this time. He offered to throw open the books of the company for examination by the employees. Schedules, overtime payment and other similar matters were said to be as favorable to the employees as it is possible to make them.

The reply presented by the railway to the trainmen contained a complete and careful analysis of the entire situation. It was pointed out that the wage scale demanded, which is 30 per cent higher than the present one, and the other changes suggested would involve an annual charge upon the company of approximately $4,000,000. In presenting the new contract to replace the agreement which ends Aug. 1 no reason was given why these enormous increases should be made. The company showed that the present wage scale is 100 per cent higher than that which prevailed in 1913, whereas according to statistics of the United States Bureau of Labor the cost of living in New York City is now only about 75 per cent higher than it was at that time. The rate asked for, 65 cents an hour, would amount to an increase of 160 per cent over 1913. From these facts the company argues that the demands cannot possibly be justified by the cost of living.

RAILWAY OPERATING AT DEFICIT

In contrast to the steadily increasing disbursements for wages, it is shown that the owners of the property have received no dividends since 1917, but have been burdened with a deficit, which at the end of the year 1922 amounted to $1,252,288. Successful operation of the railway cannot continue, the president said, unless the capital invested is accorded a fair treatment and a return paid thereon.

In regard to working conditions, the demand is that 50 per cent of the runs shall be nine hours straight, an additional 20 per cent shall be finished within ten hours, 20 per cent more shall be finished within eleven hours and the remaining 10 per cent shall be finished in as short a time thereafter as may be possible. The company forcibly points out in its reply that any increase in the number of straight runs or the shortening of swing runs will inevitably result in an increase in tripper service. This would be expensive and annoying to the company and detrimental to the employees.

As a counter proposal the company suggests the continuation of the present agreement for another five years. In completing his statement the president mentioned the pleasant relations which have existed between the members and the management, said he hoped they would continue and expressed willingness to discuss matters further at any future date.

Meetings to act upon the offer of the president have already been held by the trainmen in the various cities served by the Public Service Railway. All of these meetings have emphatically refused to accept his proposal. The employees declare that their wages of 50 cents an hour are the lowest in the country for any similar property.

Illinois Motor Vehicle Law Revised

The motor vehicle law of Illinois has been revised in these essentials:

Reduces the maximum weight permitted on the road surface on any two wheels from 16,000 to 13,000 lb; the gross weight of a self-propelled vehicle from 24,000 to 20,000 lb., and the gross weight of a vehicle and trailer from 32,000 to 26,000 lb. Provides that tractors may be operated on improved highways if the cleats are attached in such a way as to be continuously in contact with the road surface and the weight per inch of width of such cleats does not exceed 800 lb; that freight carriers operating on the state highways pay an additional annual license fee of $1 for each 100 lb., gross weight, if over fixed routes, $3; that passenger carriers operating over fixed routes pay $3 for each 100 lb. gross weight, computed at 125 lb. per passenger; that mirrors be attached to all trucks so that the driver can see the road behind. Increases the speed limit from 30 to 35 miles an hour. Requires operators of passenger or freight carriers on the public highways to file bonds of $5,000 for each vehicle.

Puget Sound Suit Dismissed

The "specific performance" suit of the Puget Sound Power & Light Company against the city of Seattle was formally closed when the United States District Court received the mandate of the Circuit Court of Appeals ordering Federal Judge E. E. Cushman to enter a decree reversing his original decision. The suit was a fight of the Seattle taxpayers to prevent forever invasion by the city of the general fund by taxation for payment of the interest and principal of the purchase price of the railway system. The Corporation Counsel will draft a form of decree to be signed by Judge E. E. Cushman, dismissing the company's suit, which sought to compel the city to complete the contract for purchase of the railway lines. The city's defense to the suit was that it already was living up to the contract.

Under Judge Cushman's decision, the city would have been obligated to resort to taxation if necessary to support the municipal railway and pay interest and bond redemption to the Stone & Webster interests. Judge Cushman, however, was reversed by the Circuit Court of Appeals, whose ruling was affirmed by the United States Supreme Court. The decision of the Circuit Court of Appeals was entered Dec. 4, 1922, and the ruling of the United States Supreme Court denying the power company's petition for a writ of certiorari was entered April 16, 1923.

News Notes

Men Accept Compromise Wage.—Employees of the Ithaca Traction Corporation have accepted a compromise wage of 46 cents an hour. They had demanded 50 cents, and when this scale was refused by the company the men walked out. The strike lasted less than a week. Conferences brought the demand down to 46 cents, which the men accepted.

Traffic Surveys for Wichita and Topeka.—John A. Beeler will conduct traffic surveys at Wichita and Topeka similar to the one made recently in Peoria, reported in the ELECTRIC RAILWAY JOURNAL for July 7, page 29. All of these properties are now included in the system of the Illinois Power & Light Company, the successor to the Illinois Traction Company.

Wages Advanced.—Trainmen on the New York & Long Island Traction Company have received an increase in wages effective July 1. The new scale in cents per hour is from 49 cents for the first year to 57 cents inclusive for the five-year men. The former scale was 41 cents to 53 cents for the men who had been in the company's service ten years or more. The New York & Long Island Traction Company operates about 40 miles of line over the central, western and southern sections of Nassau County in Long Island.

Men Accept Wage Award.—As the result of an award fixed by the arbitration board and accepted by the trainmen of the Youngstown & Ohio River Railroad, operating an interurban passenger line and freight service between East Liverpool and Salem, wages will be increased 6 cents an hour. The new scale is retroactive to May 1. The maximum hourly wage has, therefore, been increased from 50 to 56 cents. Overtime will be paid for at the rate of time and a half. The new agreement will terminate on May 1, 1924.

New Franchise in Preparation.—It is understood that the officers of the Columbus Railway, Power & Light Company, Columbus, Ohio, are preparing a new franchise for presentation to the present Council. Under the City Charter provisions, renewal of the franchise cannot come up prior to two years before its expiration except by a vote of five members of Council. As the present franchise does not expire until two years from next February, the company cannot have its proposed renewal considered by the present Council unless five members are willing. Any time after next February the company could have the proposed new franchise introduced for consideration without the approval of five members, but by that time the personnel of Council will have changed, as four members are to be elected in November.

Foreign News

Substitution of Trackless Trolley for Tramway

Quite a stir was caused at first in English tramway circles by an announcement that the Town Council of Keighley, in Yorkshire, England, had decided to abolish its entire tramway system and substitute trackless trolley cars. The importance of this move is, however, somewhat reduced when it is ascertained that the municipality in question possesses only 3 or 4 miles of tramway route.

The local officials are well acquainted with the running of railless trolley cars, as they were among the earliest tramway authorities in England to adopt the railless car. For a number of years trackless cars, with the old Austrian over-running trolley, have been in use to a limited extent as an auxiliary to the tramways, and a few petrol buses have also been employed on still other routes. It does not appear that any of the three systems has been a great financial success, though of course the total population to be worked upon is comparatively limited.

The Town Council is not dissatisfied with tramway traction. Indeed, the chairman of the Tramways Committee said at the meeting of the Council that tramcars were the most satisfactory vehicles all round, and that if the Council could get some relief for the maintenance of the roads he would advise that the tramways be continued. As such relief could not be obtained the town could not afford at the expense of the tramway department to renew the tracks and maintain the roadway. It appears that nearly £130,000 would be required for track renewals, and that capital charges on this and the cost of repairs would be about £6,150 per annum. The cost of removing the rails would be offset by the sale of them, while the work of repaving, etc., to put the roads in condition so that the Council would take them over and maintain them as main roads was estimated at about £12,000.

It will be observed accordingly that a fundamental feature is that the cost of highway maintenance on the present tramway routes is to be transferred from the tramway undertaking, with an ultimate fall back on the borough rate payers to the county rate payers. This should be quite an agreeable financial arrangement for the borough, though what the county will say about it remains to be heard. Doubtless the objection from this source will develop when the Town Council proceeds to apply for an order to authorize the substitution of the trackless cars for the tramways. On the other hand, the Town Council will probably be called on to contribute to the cost of maintaining the roads in question.

It is proposed to purchase six double-deck trolley vehicles, to convert five single-deck vehicles now in use, and to purchase three single-deck vehicles. The cost of these, along with £3,640 for conversion of the overhead equipment, is put at £27,850, or rather less than the cost of renewing 2¾ miles of tramway track. According to estimates, the annual revenue from the combined new and old trackless trolley system will be about £25,660, while capital charges and working expenses will be about £22,690. The surplus of £2,970 would cover the capital charges on the superseded tramways.

The British Tramway Association

The annual congress of the Tramways & Light Railways Association was held at Swansea, Wales, on June 21 and 22. Papers were submitted on some of today's problems and on tramway rolling stock.

British Electric Traction Company Sees Better Times Ahead

At the annual meeting of the British Electric Traction Company, held in London on June 15, J. S. Austen, the chairman, said that during the past year the company had done a little better than in the previous year. The directors were able to recommend the payment of a dividend of 5 per cent, the first distribution at that rate for some years. During the year £60,000 of debenture stock was redeemed, and the discount on that, amounting to £11,000, was applied to reducing the value of the securities. In addition, about £70,000 profit had been realized from sales of securities. This sum was also applied to the reduction of stock.

In the tramway and omnibus undertakings the receipts in 1922 had been adversely affected by the general trade depression, unfavorable weather, reduced railway fares, the engineers' lock-out, competition, and some reduction in fares. Against all these factors the company had done its best to contend and had achieved a reduction in the expenses. Profits, however, were about 20 per cent below those of the previous year. On the whole Mr. Austen was quite satisfied with that result.

With regard to the electricity supply undertakings, the trade depression in the early months of the year had caused a diminished demand for electricity, but the demand had increased during the latter part of the year, so that in the result more units were sold than in 1921, but at a lower average price.

Taking the federated companies—those which the British Electric Traction managed—as a whole, there was at the moment no visible reason why the present year should not show an improvement over the past. With regard to the tramway and omnibus companies, during the first three months of the year the results, compared with those of the corresponding period of 1922, show a substantial increase, indicating better results ahead this year.

Some London Tramway Aspects

In the House of Commons on May 31 some discussion took place on the London County Council (money) bill—a bill of the sort being required every year to meet the financial requirements of the Council. Viscount Curzon inquired where the London tramway system was worked with due regard to economy. He said that the Council declared that if it was permitted to connect its lines here and there the organizations could be made to pay. But these connecting lines would mean the introduction of tramways on busy arteries already badly congested with traffic. The Council should give more attention to street widenings. G. Hume, replying for the Council, explained that the most important matter in the bill in regard to new borrowing powers was for housing purposes. The tramway items were for clearing up purposes, not a single tramway extension being contemplated. The London traffic problem would shortly again force itself on the attention of the House. Before the summer was over 1,000 more omnibuses would be on the streets, and by next spring the position would have become intolerable. The tramways had never come on the local rates until the difficult years after the war. In 1919 there was a deficiency of £100,000; in 1920 £590,000, and in 1921, £80,000. But this year there would be a surplus of £100,000. The Council was now asking authority to raise £150,000 to remotor the cars in order to speed them up for the convenience of the public. The bill was given a second reading.

[The omnibuses referred to are run by companies in competition with the County Council's tramways.]

An Ancient Electric Locomotive

The first electric locomotive operated on the first "tube" railway in the world made its last journey on April 25. This locomotive, No. 1, was designed and constructed by Mather & Platt, and it began to run daily service on the City & South London Railway in 1890. The last journey was from Stockwell depot to the science museum at South Kensington, where it takes its place with the "Rocket," "Puffing Billy," "Sans Pareil" and other samples of the earliest steam locomotives in Britain. The City & South London Railway is the only London "tube" line on which electric locomotives are still in use, and they will all disappear when the reconstructed line reopens some nine months hence. Multiple-unit trains will then be used.

Financial and Corporate

"L" Roads in Chicago to Consolidate

The four elevated railways in Chicago are to be consolidated into one corporation. The proposal to carry out a plan of this kind has been under consideration for some time, but on July 17 announcement of the details of the plan for the reorganization of the finances of the railroads was made by the protective committee representing the noteholders.

The proposed reorganization and readjustment of the financial structure of the elevated railroads and the consolidation of the lines into one corporation will reduce the funded debt and capitalization of the roads to an amount approximately the same as the valuation of the property fixed by the Illinois Public Utilities Commission in 1919.

Although the roads have been operated for several years as a unified system under the direction of Samuel Insull, they have maintained their individual corporate existence. The Illinois Commerce Commission has already approved the merger of the Metropolitan, Northwestern and South Side lines and the purchase of the Oak Park line by the Chicago Elevated Railways Collateral Trust when the court orders its sale. The Oak Park line has been in the hands of a receiver for several years.

The plan about to be put into effect calls for a drastic scaling down of capitalization. The present outstanding debt and securities of the four companies is about $121,895,000. In the new corporation it is proposed to reduce this total to $87,196,500. The property value of the companies as fixed by the state commission for rate-making purposes is $89,514,932.

The proposed reduction in capitalization of about $34,700,000 will be accomplished chiefly by the wiping out of the Chicago Elevated Railways preferred and common shares, which at par value amount to about $40,999,000. The new corporation will have $20,329,500 of common stock, but this will go to holders of other securities of the old companies. In the proposed reorganization the underlying mortgage bonds and equipment notes of the operating companies, which total $46,704,000, will remain undisturbed.

Purchase Ordinance Prepared for Introduction in Milwaukee

Sixty-five million dollars must be spent by the city of Milwaukee to acquire all the holdings of the Milwaukee Electric Railway & Light Company. By acquiring only the property in the metropolitan area Milwaukee must expend $50,728,000.

This information was revealed after two years of study by the special committee of the Common Council on acquisition of public utilities. This valuation is included in the final draft of the ordinance for municipal ownership of the company which the committee hopes to present to the Common Council at its next meeting.

The ordinance provides that the city acquire merely the holdings in the metropolitan area. In brief, this means all the property of the company in Milwaukee County, excluding the electric interurban lines which run to Kenosha, Racine and other points outside the metropolitan area. Thus, it will be seen that the company will retain ownership of $15,000,000 in property outside this zone should the Common Council approve the ordinance.

The ordinance provides that the city has the option to take over the company by direct purchase or on the piecemeal system.

Authority to Issue New Securities Sought by Illinois Power & Light Corporation

Improvements estimated to cost $1,880,000, to be made on the Illinois Traction System, will be paid for out of the proceeds of an issue of $2,059,600 of 7 per cent preferred stock. Authority to sell such an issue is being sought by the Illinois Power & Light Corporation from the Illinois Commerce Commission. The company also plans to issue $1,905,000 of first and refunding mortgage bonds with which to reimburse it for money already spent for new power houses, boiler plants and railway and other improvements. The principal items included in the program of improvements are $1,200,000 for a new power house at Venice, Ill., and $98,862 for a new turbine.

The Illinois Power & Light Corporation has entered into a contract with the Missouri Utilities Company, Mexico, Mo., whereby it will acquire control of the common stock of that company. The stock was purchased from E. R. Locke and Willy F. Corl, Mexico. The purchase price was not revealed.

Creditable Progress Made in Detroit

Research Bureau Reports that Revenue of Municipal Railway for Eleven and One-Half Months Is in Excess of All Charges Made for Operation and Maintenance, Except Depreciation, and Interest and Sinking Fund Requirements

REFERENCE was made in ELECTRIC RAILWAY JOURNAL, July 7, page 34, to a report on the finances of the Department of Street Railways of Detroit, presented by the Detroit Bureau of Governmental Research, Inc. This report has now been published in full in *Public Business*, issued frequently by the bureau "to circulate facts concerning city, county and state governments for citizens of Detroit."

As was indicated previously the bureau holds that the contract between the city and the Detroit United Railway, from which the present municipal properties were purchased, constitutes an unusually heavy financial burden. It is suggested that consideration be given to its refinancing. The conclusions of the bureau, based upon the facts set forth by the records of the Department of Street Railways and subject to final verification by independent audit, are as follows:

That under the circumstances, creditable progress has been made toward solving the financial problems of the Department of Street Railways.

That general city taxes have not borne any charge for interest and sinking fund payments.

That the revenues of the Department of Street Railways during the past eleven and one-half months are in excess of all charges made for operation and maintenance (except depreciation), and interest and sinking fund requirements.

That sufficient reserves are being set aside in a sinking fund to provide for the payments of interest and to retire all outstanding bonds issued on behalf of the Department of Street Railways.

That sufficient reserves are being set aside to meet the nineteen semi-annual payments of $500,000 each on the purchase contract with the Detroit United Railway and to make the final payment of $7,580,000, due in 1931.

That reserves based upon general and local experience are being set aside from earnings to meet claims from injuries and damages, taxes, and insurance.

That partial rehabilitation of the property acquired from the Detroit United Railway, to the extent described in this report, some of which might fairly be chargeable to capital, has been effected and paid for out of earnings. To finance from earnings the extensive program of rehabilitation necessary to needed service will require several years if uninterrupted by business depression. To complete such program promptly will necessitate either an issue of bonds or an increase in rate of fare.

That if earnings under existing conditions are applied toward rehabilitation, extensions to furnish satisfactory service must be provided by the issue of bonds or by an increase in rate of fare.

That the purchase contract for the acquisition of the Detroit United Railway lines, although expedient under the then existing debt limitations, constitutes an unduly heavy financial burden, and it is suggested that consideration be given to its refinancing.

That a depreciation reserve, as such, has not been established, but it is understood that the Board of Street Railway Commissioners agrees such reserve is highly desirable as a means of determining actual property values, operating costs, and proper rate of fare, and contemplates the establishment of a depreciation account in the near future.

It will be recalled that the purchase contract was approved by the vote of the people on April 17, 1922, and became effective on May 15, 1922. The amount of the contract was $19,850,000, with an initial down payment of $2,770,000 and semi-annual payments of $500,000, each for a ten-year period, the balance, $7,580,000, becoming due on Dec. 31, 1931. The initial payment of $2,770,000 was provided out of the bond issue of $4,000,000 authorized at the time the purchase agreement was approved. The balance of the bond issue, $1,330,000, is available as author-

ized for the payment of supplies received from the D. U. R., the purchase price of which is in process of arbitration.

The bureau explains that the date April 30, 1923, was taken for the compilation of the report because it was the latest date for which complete financial and operating statistics were available at the time of the study. This therefore accounts for the period of eleven months and a half covered by the report as presented. The bureau says, however, that the accuracy of the figures and of the conclusions drawn from them must depend upon the integrity with which the financial records have been maintained. It feels assured by test that revenues have been reported and that the expenditures as between current operation and capital outlay have been carefully distinguished in the documents of original entry and fully and correctly reported, but that the final accuracy of the financial statements must depend upon the report of the next audit, which probably will be made as of June 30, 1923. The statement of revenues and expenses for the eleven and one-half months as contained in the report is shown in the accompanying table.

Detroit Municipal Railway Earnings for the period May 15, 1922, through April 30, 1923.

Passenger revenue	$17,917,395
Parlor, sleeping and special car revenue	1,470
Miscellaneous transportation revenue	1
Station and car privileges	112,925
Rent of track and facilities	943,599
Miscellaneous income	25,625
Rent and other income from physical property	14,152
Income from unfunded securities (bank balances, notes, etc.)	47,373
Income from sinking fund and other reserves	5,092
Total revenues	$19,067,631

For the same period, expenses were as follows:

Maintenance of way and structures	$1,763,755
Maintenance of equipment	1,225,367
Power	1,884,726
Conducting transportation	7,085,257
Traffic expenses	1,367
General and miscellaneous expense	1,408,324
Total operating expenses	$13,368,796
Taxes	625,748
Miscellaneous rents	7,075
Interest on purchase bonds ($4,000,000)	147,994
Interest on construction bonds ($15,000,000)	695,516
Interest on purchase contract	951,980
Sinking fund on purchase bonds	99,665
Sinking fund on construction bonds	471,849
Sinking fund on purchase contract (19 payments at $500,000; final payment, $7,580,000)	1,666,556
Amortization expense on funded debt	1,816
Total expenses	$18,036,995

The figures of earnings are inclusive not only of transportation but of all other operations, which arise through furnishing the transportation service of the city.

The net excess of income over operating expenses, taxes, interest, and sinking fund requirements (but not including depreciation), for eleven and a half months ended April 30, 1923, was therefore, $1,030,635, before the net loss of $1,843 from bus service is deducted. The report says that were the Department of Street Railways owned and operated by a private company, its statement of net earnings before depreciation (not a statement of the excess of income over operating expenses, taxes, interest and sinking fund requirements, as shown above), for the eleven and one-half months, would be $5,066,009, as follows:

Operating revenues		$19,067,631
Operating expenses		13,368,796
Net revenues		$5,698,834
Taxes	$625,748	
Miscellaneous rents	7,075	
		632,824
Net operating earnings before depreciation		$5,066,009
Interest		1,795,487
Net earnings available for depreciation, sinking fund for indebtedness, extensions, etc.		$3,270,522

It is explained by the bureau that in the expenditures above stated for operating expenses there are included expenditures charged to maintenance which are properly chargeable to capital. On the matter of depreciation the bureau says:

> The Department of Street Railways, with the experience of substantially a year's operation, is now in a position to classify the entire properties and set up an adequate depreciation account. The bureau understands that this will be done. This charge, when ascertained, will be made against the net earnings before depreciation of $5,066,009 above shown.

On this same matter it says elsewhere in the report:

> At present no depreciation reserve, as such, is established, although expenditures properly chargeable to capital have been charged as maintenance, and indebtedness in excess of an estimated amount of depreciation for the period has been retired from earnings. The Department of Street Railways has provided and to date is maintaining:
>
> (a) A sinking fund out of earnings for the retirement of its bonded indebtedness at maturity.
>
> (b) A sinking fund out of earnings to pay the purchase price under the D. U. R. contract.
>
> In this respect, the D. S. R. differs from a privately owned street railway corporation in that it is mandatory upon the municipal utility to retire its indebtedness from earnings.

The total of the city's equity in the railway properties is placed at $3,633,758. The excess of assets over liabilities, or the surplus, as of April 30, 1923, was $1,311,687. The assets as of April 30 are given as $40,898,038. The total liabilities at the same date are given as $37,264,280, exclusive of the city's equity of $3,633,758. The bureau says that the present fare—5 cents with 1 cent additional for transfer—amounts to an average fare of nearly 5½ cents.

The direction of the Bureau of Governmental Research rests with a board of nine trustees and the personnel includes leaders in their several walks of life, among them merchants, bankers and professional men. The bureau is organized to increase the affectiveness of local government through co-operation with officials and by keeping citizens informed about the city's business. The bureau is absolutely non-partisan, and takes no part in the election or appointment of persons to office. The cost of the bureau is financed and controlled by the Detroit Community Fund, but only such contributions are used as are specifically designated to the bureau by the donors.

Ohio Interurban Being Dismantled

The power plant of the Springfield, Troy & Piqua Traction Company at Springfield, Ohio, is being dismantled. This marks the final step in the junking of the road by the Schoenthal Company, Columbus, which purchased the properties at receiver's sale. The tracks, etc., have already been scrapped, except for 2 miles of the right-of-way, which has not been touched. A car is being operated over the portion between Springfield and Maitland by the Springfield & Suburban Railway, owned by the Schoenthal Company. This line provides transportation for employees of the Victor Rubber Company, and also serves as a transfer between the Erie passenger station at Maitland and Springfield, as well as for the transfer of freight in Springfield. An attempt was made by persons residing along the line to form a company to take over the property, but the deal fell through. The Schoenthal Company did not begin the work of scrapping the line until it became apparent that the effort had failed which was being made by the residents to finance a new company to operate the line.

Saginaw Sale Aug. 18—Reorganization Terms Announced

The sale of the local property of the Saginaw-Bay City Railway will take place on Aug. 18. This is the date which has been fixed by the referee in bankruptcy, acting on the petition filed in the United States Court by Trustee Otto Schupp. Under the court order the sale will be free and clear of all mortgages. Mr. Schupp, as grantee under the franchise recently voted by the people, has formally accepted the contract, and will assign it to a new operating company as soon as it is organized. The property will, of course, be financed as agreed between the grantee and the City Council.

In this connection joint committees of bondholders of the Saginaw-Bay City Railway and the Saginaw Valley Traction Company have submitted a reorganization plan to the security holders along the lines laid down by the new franchise ordinance.

The plan calls for the incorporation of a new company, probably to be known as the Saginaw Transportation Company, which will issue 20,000 shares of non-par common stock, 14,790 shares of 5 per cent preferred, par $100, cumulative after Jan. 1, 1924, and approximately $1,000,000 of twenty-five year 5 per cent bonds under an open mortgage, maturing on Jan. 1, 1949. The bonds will constitute a first lien on all the property and will be redeemable at 102 and interest.

It is intended to exchange the old $584,000 Saginaw Valley Traction bonds

for an equal face amount of new company bonds, with a bonus of one share of new common stock for each $500 face amount of the old bonds; the $1,479,000 Saginaw-Bay City first and refunding 5s are to be exchanged for an equal amount in par value of the new preferred stock and the right to subscribe, pro rata, to $400,000 additional bonds at not less than 85 and 18,832 shares of the new common stock at a price to be determined later. The proceeds from the sale of the $400,000 bonds are to be used in carrying out terms of the franchise in respect to betterments and payment of prior claims.

By this plan interest charges will be cut from about $117,000 annually to $50,000.

The franchise terms give the new company the right to charge a 10-cent cash fare instead of the present 6-cent fare. The provisions of the grant were reviewed at length in the ELECTRIC RAILWAY JOURNAL for July 14, page 70.

Wisconsin-Minnesota Property Bought by Byllesby

H. M. Byllesby & Company, Chicago, have purchased control of the Wisconsin-Minnesota Light & Power Company from the American Public Utilities Company.

The former officers of the Wisconsin-Minnesota Company have resigned and the following board of directors has been elected: H. M. Byllesby, president; R. F. Pack, vice-president; Halford Erickson, vice-president; A. S. Huey, J. J. O'Brien, R. J. Graf, F. W. Stehr, F. C. Shenehon, J. H. Briggs, H. W. Fuller and John H. Roemer.

The Wisconsin-Minnesota Company owns and controls 71,800 hp. of developed water power and 700 miles of transmission lines in western Wisconsin, supplying electricity to seventy-three cities and towns. The territory served by it is contiguous to part of that supplied by the Northern States Power Company. Both companies include in their holdings electric railway properties, the most important one being the line from Chippewa Falls to Eau Claire.

Auction Sales in New York.—At the public auction rooms in New York there were no sales of electric railway securities this week.

New Jersey Subsidiary to Issue Stock.—The State Board of Public Utility Commissioners of New Jersey has approved the issuance of $12,750,000 capital stock of the Public Service Electric Company, a subsidiary of the Public Service Corporation of New Jersey.

Dividend Declared.—The directors of the Madison Railways, Madison, Wis., at a meeting held on July 9 declared a semi-annual dividend at the rate of 7 per cent on the preferred stock of the company issued subsequent to March 1, 1922. The dividend is payable on Aug. 1 to stockholders of record on July 20. A bonus at the rate of 1 per cent per annum will also be paid under the same condition.

Certificates Offered. — Putnam & Company, Hartford, recently offered at 100 and accrued interest $487,500 of the 6 per cent equipment trust certificates of the Connecticut Company known as series F. The certificates are dated July 2, 1923, and are due serially in semi-annual installments Jan. 1, 1924, to July 1, 1928, inclusive. The certificates were issued in part payment for standard railway equipment consisting of fifty new double-truck cars, described in the ELECTRIC RAILWAY JOURNAL, issue of June 16.

Commission to Hear Valuation Appeal.—The Missouri Public Service Commission set July 19 as the date for hearing the motions filed by the United Railways and the city of St. Louis, Mo., for a rehearing in the valuation case of the United Railways. The company contends that the valuation of $51,700,000, placed by the commission on the company's property was too low. The city says it is too large. The decision of the commission fixing the valuation was reviewed at length in the ELECTRIC RAILWAY JOURNAL for June 9, page 980.

Purchase Negotiations Being Resumed.—Negotiations have been resumed for the purchase of the private right-of-way of the New York & North Shore line by the city of New York. Watson Robinson, attorney for the bondholders of the defunct company, said recently that he had made an offer to sell the private right-of-way and the tracks and wires of the entire line to the city for $50,000. Of the $50,000, should the offer be accepted, the bondholders would receive $40,000. The proposition is now being considered by A. J. Rinn, real estate appraiser of the controller's office.

Abandonment Authorized. — The Board of Public Utility Commissioners of New Jersey has granted permission to the Jersey Central Traction Company to abandon its lines in Middlesex County, New Jersey. Notwithstanding numerous experiments with regard to the rate of fare charged in order to increase riding the company has not been able to earn operating expenses, much less additional moneys required to pay interest on bonds. The plea of the company to the board to abandon service was reviewed at length in the ELECTRIC RAILWAY JOURNAL for July 7, page 33. Operation will be discontinued at midnight on July 28.

Utilities at Jamaica Under Stone & Webster—Stone & Webster, Inc., Boston, Mass., have been appointed general managers of a new company which has been organized by Montreal banking interests to carry on the electric light and power and electric railway business in Kingston, Jamaica, British West Indies. The financing has been done by a syndicate headed by Greenshields & Company, and including Aemilius Jarvis & Company, and Mackenzie & Kingman. The new company has acquired by purchase the West India Electric Company, Ltd., and the Jamaica Electric Light & Power Company, Ltd., which have been combined into the Jamaica Public Service Company, Ltd. It will do the entire electric light and power and tramway business in Kingston and the adjoining parishes of St. Andrew and St. Katherine.

Old Nassau Lines Taken Over by B.-M. T.—At midnight on July 13 the Brooklyn-Manhattan Transit Corporation took over the operation of the lines of the Nassau Electric Railroad, which has been in the hands of receivers since Dec. 31, 1921. This is in accordance with an order signed by Judge Julius M. Mayer in the Federal court for the Southern District, who appointed Lindley M. Garrison receiver for the Nassau lines. This is the first of the surface lines to be returned to the successor company to the Brooklyn Rapid Transit Company.

Line in Bad Condition.—Appraisal of the tangible properties of the Tacoma Municipal Railway line and an examination of the accounts of the system in City Comptroller John Roberts' office did not lend much comfort to any hope of the Emergency Fleet Corporation that the line will be worth fighting for to collect $232,000 loaned to the city during war times for enlarged service, according to city officials. The rolling stock is wearing out, the engineers found, and despite an admitted economical operation of the line, a monthly deficit was found. During May the deficit was $2,198, an increase over that of April. The appraisal and book examination were made as a part of the preliminaries of the negotiations which are expected to be made between the city and government for a settlement of the loan, which the city maintains should be entirely written off as a war expense.

Reduction in Valuation Sought in Tax Case.—J. F. Evans, tax attorney for the United Railways, St. Louis, on July 14 appeared before the Missouri State Tax Commission and requested that the road be permitted to reduce its tax return $8,300,000. He stated the road made a return listing its properties at approximately $60,000,000, and that the Missouri Public Service Commission later fixed the railway's valuation for rate-making purposes at $51,700,000. He asked that the tax return be cut that amount, and also that only 80 per cent, or $41,360,000, be subject to taxation. Mr. Evans said that the $70,000,000 valuation which the company sought to have placed on its property in the recent valuation case before the Missouri Public Service Commission included about $9,000,000 of "non-essentials" for tax-making purposes and also $1,500,000 of depreciation. He was granted a week in which to prepare a brief supporting his oral arguments before the tax board. A decision is expected to be made in September.

Traffic and Transportation

Separate Service for Commuters

Engineer for New York Commission Sees Need for City Service Independent of Present Subways

Daniel L. Turner, consulting engineer for the New York Transit Commission, after a preliminary survey of suburban traffic, has recommended the construction of a new rapid transit system in Manhattan, independent of present subways, designed for the sole purpose of handling commuting traffic. Mr. Turner came out strongly in favor of this rather than the alternative of building a union suburban terminal in the heart of the city. He said this would only make for greater congestion on existing lines.

Co-operation of all the railroads entering this city has been secured by the Transit Commission in searching for a permanent remedy for the commuting problem. Engineers of the State board and the companies have had a series of consultations on this subject and more are under way.

In the report by Mr. Turner the problem is discussed as follows:

1. Ten years hence it will be impossible to accommodate the 600,000,000 or more suburban passengers per year with the facilities that now exist.
2. It will be impossible to take care of this traffic on the transit lines designed for the use of city traffic. It will be as much as the city can do to obtain facilities enough to accommodate the city traffic originating within its own limits.
3. It will be impossible to interject the steam railroad suburban traffic that will have developed ten years hence into the city transit lines now terminating at points near the outer boundaries of the city.
4. In order to accommodate the suburban business originating on the steam railroad lines it will be necessary to do one of two things, either:

(a) Provide additional terminals for the accommodation of this rapidly increasing suburban traffic which will relieve the existing terminals, or,

(b) Shunt all of the suburban traffic past the existing terminals and provide a separate and independent collecting and distributing transit system traversing central Manhattan for the exclusive use of suburbanites now served by existing steam railroad lines.

In other words, the solution of the problem means building new suburban terminals or distributing the traffic through central Manhattan just as the rapid transit lines now distribute the traffic originating along the outlying branches of such lines.

It is Mr. Turner's opinion that it would be a mistake to follow the first of these alternatives—that is, to build new terminals for the use of suburban traffic. As he sees it, this would only mean concentrating the suburban business at separate points and creating congestion worse than now exists. From these congested points the traffic would have to be delivered to its destination over the city transit facilities, thereby throttling these facilities and prohibiting them from properly serving the area within the limits of the city. It would be just as reasonable to dump all of the rapid transit traffic originating on the city transit lines at two or three points in central Manhattan and expect it to find its way to its destination over some other lines of transit as it would be to provide for the future handling of suburban traffic from terminals in such a manner. In conclusion Mr. Turner said:

In my judgment the only way that this problem can be properly solved is to develop an independent transit system traversing central Manhattan for the exclusive use of the suburban passengers of the future; in other words, the only adequate solution of the problem will be the development of a metropolitan transit plan to be independent of, and to be superimposed over, the transit plan designed to serve the city exclusively. Just how this can best be done will depend on the conclusion of our studies.

United Traction Takes Action Against Jitneys

A loss of from $500 to $1,000 a day is claimed by the United Traction Company, Albany, N. Y., through illegal operation of jitneys. This claim was made in its contempt of court action brought July 14 against sixteen Troy jitney drivers charged by the company with violation of the Hinman injunction order of Sept. 10, 1921, which restrains jitney operators from competing with the trolley company.

The United Traction Company is preparing to serve papers on more than 100 additional jitney operators in Albany and Troy, according to Ernest Murphy, superintendent of the company.

J. Stanley Carter, attorney for the traction company, said that the alleged violations have been occurring since May and that the jitney men have been operating on several lines of the company. In spite of the Hinman injunction order, jitney service between Albany and Troy has not ceased altogether since the United Traction trolley strike of two years ago.

Mayor Praises Traction Management

Mayor W. A. Magee of Pittsburgh, Pa., predicted better railway service and lower fares in a talk to members of the Pittsburgh Advertising Club on June 26. Among other things he said:

It is not unlikely that in the next few months the genius of the Philadelphia Company, A. W. Thompson, who is working hard to regenerate the insolvent Pittsburgh Railways, will have brought success out of failure and that with new equipment and new leaders the street car system will improve its service in every way and that with this improvement in service there will come a lowering of carfares.

The Mayor is a Republican, but the Pittsburgh *Post*, a Democratic paper, took the Mayor's speech as a text for its leading editorial in the issue of June 28. In concluding its comment that paper said:

If Mayor Magee were to deliver such an address every week, keeping the attention of the public focused on these important subjects, he would find the effect most encouraging.

Commission Reserves Decision in Rate Case Involving Reductions

Hearings were concluded recently in the Nashville Railway & Light Company case under an order of the State Railroad & Public Utilities Commission to show cause why rates should not be reduced on light, power and car fare. Experts who made the investigation for the commission find that the company has lacked $169,000 of paying the stipulated return of 6½ per cent on its investment.

The testimony presented at the final hearing touched directly upon the assumed contracts existing between the Nashville Railway & Light Company and two supervising companies, by which the local concern must pay to one of these supervisors 2 per cent and to the other 6 per cent, or a total of $140,000 annually. The commission sought to ascertain whether the contracts were really valuable to the company or its consumers.

At the concluding session the company introduced Halford Erickson of Chicago, vice-president of the H. M. Byllesby Management Corporation. He said about 75 or 80 per cent of utility companies are under supervising companies, and they derive great benefit from these large corporations in the financing of their properties, and in the availability of expert service. He said this also makes it possible for small communities to get service that they could not otherwise afford.

Following the conclusion of the testimony, Attorney W. E. Norvell, representing the company, asked that the commission issue an order permitting the Nashville Railway & Light Company to use a part or all of its depreciation reserve in extensions and additions to its plant, and agreeing that it will be returned to the reserve fund with 4 per cent interest over a period of years to be determined upon.

The commission announced at the conclusion of the hearing that it would issue, through its chairman, Harvey H. Hannah, a formal order in the case at an early date. The case has been pending before the commission since last May.

Arrangements Under Way for Acquisition of Bus Line

Final negotiations are now under way for the transfer of the Woburn-Reading Bus Line, Inc., to the Eastern Massachusetts Street Railway. The railway will take over the bus business in Woburn, North Woburn, Wakefield, Reading, Stoneham and from Wakefield Square to Wakefield Park, from Wakefield Square to North Saugus and from Wakefield to Reading by way of Lakeside.

The Eastern Massachusetts will substitute its own buses for those operated by the Woburn-Reading line. The fare will be 5 cents from the center of any community to the town line and 10 cents from points on one side of the

center of a town to a point on the opposite side. Street car fares in the same community will not be affected and will remain at 10 cents per zone, except that the fourteen-ride tickets for $1, good between Wakefield Square and the Greenwood district of Wakefield, will remain in force.

County Judge Vacates Jitney Restraining Order in Schenectady

An unusual situation has developed in the city of Schenectady in connection with its trolley strike. On July 16 County Judge McMullen, claiming concurrent jurisdiction with the Supreme Court on orders issued out of court, issued an order vacating the jitney restraining order of Supreme Court Justice Angell of Glens Falls. While there seems to be a well-established legal ground for concurrent jurisdiction, the action of a county judge in setting aside an injunction order of a justice of the Supreme Court is, so far as can be determined, absolutely without precedent in this state.

The logical course of action will be for the Schenectady Railway to appeal to the Appellate Division of the Supreme Court, from which source it may hope to obtain a permanent injunction restraining jitney operations. The action of Justice McMullen has created a furor in judicial circles.

In the meantime, pending an appeal to the higher court, attorneys for the Schenectady Railway are proceeding on the assumption that the order lifting the injunction is illegal and are getting ready to summon a number of jitney operators into court for contempt of the Angell order. The order of Justice McMullen restored jitney service in Schenectady.

Harry B. Weatherwax, president of the Schenectady Railway, issued a statement in which he said that the crusade against jitneys would be vigorously waged and the Angell injunction enforced.

Railway Plans to Do Trucking Business in Michigan

The Detroit United Railway has applied to the Michigan Public Utilities Commission for permission to do a general freight hauling business with motor trucks and trailers. The application stated the Detroit United Railways Trucking Company would be immediately organized with a capital of $500,000.

It is planned not only to do straight highway hauling where necessary for package and carload lots, but to combine this with the trolley freight service of the Detroit United Railway. There will be pick-up work as well as piece distribution.

In connection with the application, President E. G. Stevenson said:

> The Detroit United has an investment of $35,000,000 in the territory it serves. It proposes to add to that investment whatever amount is necessary fully to serve the territory and at the same time guard the investment already made.

Buses Operating Under City Supervision Restrained in New York

The whole matter of the operation of buses in New York City under direction of the local city administration has been opened up again. For some time now the buses installed under city supervision have continued to run because of a stay of execution obtained by the Corporation Counsel. This stay was nullified on July 14 when the Court of Appeals refused to entertain an appeal from the ruling of the Appellate Division of the Supreme Court, which a month ago upheld Judge Mullan's injunction in a case brought by a taxpayer to prevent the appropriation of further funds for bus supervision by the city.

There are twenty-seven bus lines in operation and last year they carried more than 100,000,000 passengers. The prediction was made that they would cease service at once, but up to Thursday the court had issued no formal order and there was some speculation as to whether he would issue a stay for another thirty days.

An easy way out of the matter was suggested by the Transit Commission, which stands ready to legalize bus permits for temporary or other service, but this proposal Mayor Hylan has rejected. Instead he called a special meeting of the Board of Estimate for the purpose of adopting a resolution to appeal to the Governor to call a special session of the Legislature. On Wednesday the Governor came to the city to inquire into the situation.

In a tirade against the so-called traction interests, which he sees behind the recent court moves, Mayor Hylan said:

> The faithless flouting by the traction corporations of their franchise agreements made the installation of emergency bus routes an absolute necessity. In no other way could the comfort, convenience and welfare of the traveling public, discommoded by the deprivation of needful transit facilities, have been promptly and effectively served.

The bus owners themselves have suggested that a $3,000,000 corporation be formed to own all the buses now being run under municipal supervision and that this company apply to the Board of Estimate for a franchise revocable on ninety days' notice and containing a clause which would permit the city actually to acquire title to the bus equipment.

Weekly Pass Enters Bradford, England, Successfully

The expression "Carrying coals to Newcastle" can now be matched by the phrase "Passing the pass to Bradford," inasmuch as British tramways have long been familiar with the unlimited-ride season ticket. The differences in adoption of the weekly pass, however, are the shortening of the validity period to a calendar week (Monday to Sunday inclusive), the introduction of transferability and the sounder system of pricing. Because of the variety of fares already in use on the system, R. H. Wilkinson, the manager, recommended that the trial installation of two months be made on but one route. This is known as the Lidget Green section. It is only 1.5 miles long, so that the ordinary fare of 1.5d. (3 cents) serves the entire run. Up to 9 a.m., however, there is also available a workmen's fare of 1d. (2 cents). The pass has been priced at 2 shillings (48 cents at full exchange), equivalent to sixteen ordinary fares.

It is hoped that the pass will have the effect of giving a lower fare to those regular patrons who add non-rush rides to their rush-hour rides without causing the reduction in revenue that would have followed a cut to 1d. (2 cents) for all classes of riders.

The restriction to one route makes the pass less attractive, but this may be offset by the Britisher's zone-fare training in taking short rides and in going home for lunch.

The first two weeks are reported as satisfactory. After allowing for the diversion of traffic from a neighboring route, it was found that passengers compared with the corresponding weeks of May increased 4.3 per cent and 3.4 per cent respectively and revenue increased 2.5 per cent and 2.3 per cent respectively. In the first week (June 18) 102 084 passengers were carried, of whom 21,122 used passes; in the following week the total was 103,089, of whom 22,125 used passes. The average number of rides per pass per diem was 3.3 in both weeks.

Wants One-Man Operation Stopped

Mayor Frank X. Schwab has served notice upon Herbert G. Tulley, president of the International Railway, to cease operating one-man cars on the local lines of the company in Buffalo. He said that unless this is done at once he will bring proceedings to compel the company to do so. Mayor Schwab told the International that one-man cars are a menace to public safety. One-man cars are being operated by the company on short lines and in sections of the city where the passenger travel is exceptionally light. Since the introduction of one-man cars on these lines the frequency of the service has been almost doubled. Commenting on the demand made by Mayor Frank X. Schwab, the *Express* says: "One-man cars do not inconvenience the public, though they may be an eyesore to the union and men out of jobs."

Bus Line in Medford.—The Boston Elevated has begun operation of a motor bus line in Medford, Mass., which supplies crosstown service for the people of old Medford and Medford Hillside.

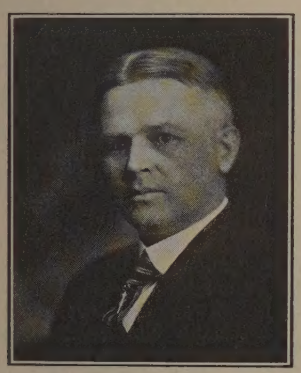
Buses Supplement Railway Service.—Bus service was started by the Eastern Wisconsin Electric Company on July 3 in Fond du Lac, Oshkosh, Van Dyne, North Fond du Lac and Neenah. This service is designed to supplement the interurban rail service of the company.

Personal Items

Iowa Association Honors Mr. Chambers

President of Des Moines City Railway Made Head of Iowa Electric Railway Association

F. C. Chambers, president and general manager of the Des Moines City Railway, has been elected president of the Iowa Electric Railway Association. Mr. Chambers joined the company as electrical and mechanical engineer in 1913. In April, 1918, he took charge of power generation and distribution for both the city and the interurban lines. Later he was placed in charge of rolling stock. In April, 1920, however, the mantle of management fell



F. C. Chambers

upon him with his assumption of the post of vice-president and general manager. Still later he was operating receiver for the company.

The periods of negotiating the franchise agreement, approved by the electors in November, 1915, and of carrying out the rehabilitation of the physical property had been passed through when Mr. Chambers assumed the rôle of manager, but the trials and tribulations incident to them were as nothing compared with the events that were to come later. Like many other cities, Des Moines had been drifting away from its railway. It had been trying to get something for nothing. The bus bug, or more properly the jitney bug, had bit it. As Elbert Hubbard once said: "You cannot fool calves by giving them whitewash instead of milk." Des Moines tried to force whitewash on its street railway calf and the calf nearly died before Des Moines discovered that something for nothing leaves nothing.

Thus it came about that the company withdrew service in July, 1921. It was not a vindictive move—the decision to stop service in Des Moines. Not all the angles to it can be reviewed here. There is no need for that. They have been told before in these pages. The withdrawal of service was purely a business matter. Des Moines starved its railway. And the railway had to shut down. On Mr. Chambers, however, fell the onus of this move. He didn't just explain. He went on and proved that the population of any city of any considerable size can be carried expeditiously and comfortably only by a responsible operating agent organized for service at the same time it is striving for profit.

It is a striking commentary on the changed state of public opinion there that the very company which such a short time ago was forced to the drastic action of shutting down service has been able to go before its own people and sell locally an issue of preferred stock to investors.

To Mr. Chambers, an engineer by profession, the events incident to the suspension of service were problems to be solved even though they did in this case mean working largely with men instead of materials. In the rehabilitation of the physical property of the company following the granting of the 1915 franchise, his efforts played an important part. It was the reputation that he made here and in his later work that led to his advancement to the post of operating head in 1922. Mr. Chambers has ever been alert to keep abreast of the latest engineering practices. He was one of the very first, for instance, to see the possibilities of the automatic substation. It was largely the early record of performance of the Des Moines installation that helped the quick spread of the automatic substation idea.

Mr. Chambers entered the traction field in 1896, in power house work for the Adrian Light, Heat & Power Company, Adrian, Mich. In 1901 he went to Rome, N. Y., as chief engineer for the Rome Gas & Electric Company. He left Rome in 1905 to become electrical engineer for the East St. Louis & Suburban Railway. From 1908 to 1911 his position was superintendent of power for the Springfield (Ill.) Consolidated Railway. In 1911 Mr. Chambers went to Chicago, where he became superintendent for the County Traction Company, now known as the Chicago & West Towns Railway. He remained with the company until 1913, when he went to Des Moines.

L. C. Bewsey, whose appointment to Cuba was announced in the ELECTRIC RAILWAY JOURNAL for June 30, has been made manager of the Cia Cubana de Electricidad at Santa Clara, Cuba. He will report to E. C. Deal, general manager of the Cuban properties. As for the Electric Bond & Share Company, to which reference was made previously in the ELECTRIC RAILWAY JOURNAL, in connection with this matter, it is not represented in Cuba at all. Mr. Bewsey was formerly superintendent of the Michigan United Railways at Kalamazoo.

C. Melvin Sharpe in Washington

Executive Assistant to President Ham Is a New Figure in Electric Railway Circles

C. Melvin Sharpe, who has recently been appointed as executive assistant to William F. Ham, president of the Washington Railway & Electric Company and the Potomac Electric Power Company, Washington, D. C., has been a resident of the nation's capital for the past twenty years.

Mr. Sharpe was born in Philadelphia in 1881, a son of George Heppard Sharpe of that city. He was educated

C. M. Sharpe

by private tutors and later at the Philadelphia School of Industrial Art and graduated as a Fellow in Art of the Pennsylvania Academy of the Fine Arts with post-graduate work abroad.

His organizing and directive abilities were recognized during the late war and the designing, engraving and manufacture of the issues of the liberty bonds and other paper securities of the government engaged his earnest and constant attention until Secretary McAdoo made him secretary of the Liberty Loan Committee of the District of Columbia. His management of various campaigns of civic and national proportions has earned for him a reputation for acutely sensing the pulse of the public and has brought him in close contact and association with men and women prominent in civic, national and international relations.

The present civil service retirement act, whereby civil employees of the government are retired after a certain term of service, was in large part due to the efforts of Mr. Sharpe, while his direction of the Interchurch World Movement Campaign in the district was a conspicuous success. His latter

work with the Chamber of Commerce of the United States and the recent brilliant work with LaSalle Extension University would seem to augur his success in his new association with the Washington Railway & Electric Company in its public relations work in Washington and the surrounding country. While he is a newcomer in electric railway work, Mr. Sharpe is a student of economics, banking and transportation matters. In his new position he will apply himself to perfecting plans looking to improvement in service.

Four New Vice-Presidents for U.G.I.

Four new vice-presidents have been elected by the board of directors of the United Gas Improvement Company, Philadelphia, Pa. This action increases the number of vice-presidents from five to seven.

Randal Morgan, who has been associated with the company for forty years, retires as vice-president and becomes chairman of the executive and finance committee.

Walter Clark, who has served the company for thirty-five years, retires as vice-president and becomes consulting engineer.

Lewis Lillie, vice-president, will in addition assume the duties of general manager.

The new vice-presidents are:

James T. Hutchings, who retires as general manager and becomes vice-president in charge of operation and of plants.

G. W. Curran, who retains the title of secretary, vice-president in charge of accounting.

J. A. Pearson, promoted from purchasing agent, who will be in charge of purchases.

F. J. Rutledge, promoted from manager of the new-business department, who will be in charge of sales of gas, electricity and appliances for using the same.

The other vice-presidents are Paul Thompson and Philip H. Gadsden. William W. Bodine becomes assistant secretary and assistant treasurer. In addition to his duties as assistant to Vice-President Lillie Mr. Bodine was also appointed secretary of the executive and finance committee. The positions of general superintendent and assistant general superintendent were abolished. Rollin Norris was appointed gas engineer, Paul Spencer electrical engineer and John B. Klumpp inspecting and valuation engineer.

Mr. Nichols in Jamaica

Alfred S. Nichols has been appointed manager of the new company which has taken over the electric light and power and the electric railway business in Kingston, Jamaica. Mr. Nichols is of English birth. He has had a wide business experience in British mercantile work and during the past twenty years in the United States in newspaper work and in the operation of public utilities. He has been with the Stone & Webster organization for thirteen years and for the past six years has been manager of the light, power, gas and street railway at Paducah, Ky., a company under Stone & Webster management. The properties at Jamaica have recently come under the direction of Stone & Webster as managers.

J. M. Penick Installed Railless Trolley in Petersburg

J. M. Penick, connected with the Virginia Railway & Power Company, Richmond, Va., since 1910, supervised the installation of the new trackless trolley service put into operation recently by that company in Petersburg. There has hardly been sufficient time under operation by this system to form a basis for accurate judgment as to its real future possibilities, but the results so far achieved with the new service promise a wider use of railless transportation in the future in Petersburg and in the other cities served by the company.

J. M. Penick

The installation of the new line was carried out under Mr. Penick in his capacity as general superintendent of railways of the Richmond and Petersburg divisions as well as the Richmond-Petersburg interurban division. He has served in these capacities since January, 1923. As indicated previously, Mr. Penick joined the company in October, 1910. His first work was assistant engineer in charge of the construction of reinforced concrete carhouses, this being the first big construction work under the company's program for rehabilitating the property after its reorganization in July, 1909.

In February, 1911, Mr. Penick was promoted to assistant chief engineer of railways, having charge of the construction and reconstruction of track, and in January, 1917, he was made engineer of maintenance of way and structures in charge of maintenance and construction of tracks, bridges and buildings. In March, 1922, as chief engineer of railways of the company, he was also placed in charge of equipment.

Obituary

G. R. Scrugham

George R. Scrugham died at his home in Cincinnati, Ohio, on July 12. Mr. Scrugham promoted the organization of the three interurban electric railways from Cincinnati to Batavia, New Richmond and Mason in 1896, and for a time was connected with the management of the Cincinnati & Eastern Electric Railway as president and general manager. Later he came into the public eye by organizing the policyholders of large life insurance companies in New York to effect reorganization of the companies. Before entering the electric railway field as an operator Mr. Scrugham had long been identified with street railway interests, principally as an officer of the Creaghead Engineering Company, Cincinnati, contractor for the construction of both city and interurban railways.

Since 1916 Mr. Scrugham had been connected with Pennsylvania coal companies, which he was reorganizing following their bankruptcy. When the campaign of Charles Evan Hughes for the Presidency was organized in 1916, Mr. Scrugham was made one of the managers, with offices in Washington. Mr. Scrugham was fifty-eight years old. He was born at Danville, Ky., but had lived in Cincinnati with his family for more than twenty-five years.

F. E. Connors

F. E. Connors, vice-president and general manager of the Spokane & Eastern Railway & Power Company and the Inland Empire Railroad of Spokane since February, 1920, died recently. He had steadily climbed the ladder of success since he first became identified with the Chicago & Alton Railroad, when he was only sixteen years old. After serving in the Chicago office for five years he went to the Santa Fé Railroad at Topeka. As was noted in the ELECTRIC RAILWAY JOURNAL of Oct. 14, 1922, Mr. Connors rose from a clerk in the stationery department when he started at Topeka to an assistant to the vice-president when he left in 1919. Following his resignation from the Santa Fé company he was appointed receiver of the Spokane & Eastern Railway & Power Company and the Inland Empire Railroad. A year later he was made vice-president and general manager, which position he held until his death.

When changes were made in the staff of the companies last fall Mr. Connors, along with Messrs. Gannaway and Paine, was chosen to continue as a captain. These three men were largely responsible for the operation of the traction lines during and after the receivership.

Since the death of Mr. Connors the offices of operating vice-president and traffic vice-president have been combined and the duties of both are being performed by Waldo G. Paine with the title of vice-president and headquarters at Spokane.

Manufactures and the Markets

News of and for Manufacturers—Market and Trade Conditions
A Department Open to Railways and Manufacturers
for Discussion of Manufacturing and Sales Matters

Mixing Manufacturing with Maintenance

By Henry S. Day
Westinghouse Electric & Manufacturing Company

From the time when electric railroads made their first appearance it has been generally regarded by operating officials as good practice to include in the shops a department for manufacturing renewal parts. Whether this belief ever had any justification is open to doubt, but today a close scrutiny of manufacturing methods and maintenance methods should convince any unbiased person that the two will not mix.

Just why a railway shop should be regarded as a manufacturing plant, capable of making anything from a filing cabinet to a wrist pin for an air compressor, is not very clear. The reason for the existence of a railway shop is not a manufacturing one. It is for maintenance and nothing else. True enough, in order properly to maintain equipment, it is necessary to have machinists and lathes, wood shop and carpenters. Beyond that, however, the parallel ends abruptly. Men and machines do not constitute a manufacturing plant without the other elements that go with them.

Manufacturers of electric railway apparatus have difficult problems to meet in making products destined for use under severe service conditions. The maintenance and upkeep of these same products develop many difficult problems, but of such a widely different nature that the manufacturer and the operator do not think in the same terms.

Today manufacturing consists of specializing, quantity buying and quantity production. Engineering, research, development, etc., all have a necessary and important place before production is started. The railway repair shop is seldom prepared to carry on such work. It is not equipped for manufacturing purposes, but is equipped only with tools and facilities for repairing. Where the manufacturer may have ten high-priced special machine tools built for speed and accuracy the average repair shop has one general utility tool, purchased with the idea of covering as wide a range of jobs as possible. Moreover, there is little doubt that the skill of workmen in manufacturing plants averages higher than it does in railway shops.

Manufacturing in a repair shop must of necessity be in small quantities, because few roads have sufficient equipment of one type to permit quantity production. The basic economies that can be effected in the future in electric railway operations will not result from the operators becoming manufacturers. They will come from closer inspection, systematic overhaul and reclamation. Carhouses and shops have today about the same appearance as they had years ago, and methods of overhauling and inspecting equipment are a good deal the same. The movement of cars, trucks and motors, however, should be worked out to obtain smooth progression. Manual labor and slow devices should be replaced by quick-moving machinery, and the repair shop should be placed on a basis similar to that of a manufacturing plant.

To summarize, the idea is that the savings sought by the operator are not to be found in manufacturing his own replacement parts, but in bringing his methods and facilities for repairing to a highly specialized and efficient point, reducing waste and developing reclamation.

Synthetic Lumber Has Possibilities

Considerable work is being done at the present time by lumber interests with a view to utilizing more fully the product of the forests. Satisfactory methods have already been developed for the manufacture of composition lumber through the utilization of sawdust in combination with a glue binder. Although this work is as yet very much in the experimental stage, it seems possible, according to the Forest Products Laboratory, that developments within the next few years will make possible the marketing of composition lumber suitable for many purposes where ordinary lumber is now used.

G. E. Officials Given College Honors

Four General Electric Company officials have recently been given honorary degrees at four important American universities.

Gerard Swope, president of the company, was awarded the honorary degree of doctor of science at Rutgers College on June 12. Owen D. Young, chairman of the board of directors, was given the degree of doctor of literature at St. Lawrence University, of which he is an alumnus, on June 12, while Dr. Irving Langmuir, assistant director of the research laboratory, received the honorary degree of doctor of science from Union College, Schenectady. David B. Rushmore, consulting engineer, was given the D.S. degree from his alma mater, Swarthmore College.

Round Trolley Wire Still in Demand

An impression prevails in some quarters that round trolley wire is decreasing in popularity, while the demand for grooved wire is increasing. According to the Bridgeport Brass Company there is no basis for such an idea. Its figures show that the proportion of grooved wire made in 1922 was no larger than the proportion made in 1916, 1917 or 1918. The total production of grooved wire is very much greater now than it was a few years ago. Inasmuch as this company is today making a great deal more trolley wire than formerly, the proportion between the grooved wire and the round wire therefore remains approximately the same.

Charles W. McKay Directs Valuation Work

Charles W. McKay, well known appraisal and valuation engineer, has been appointed manager of the division of valuation and appraisement of the Roberts-Pettijohn-Wood Corporation, consulting engineers, Chicago.

Mr. McKay was formerly president and general manager of McKay & Sherman, valuation engineers, and when Mr. Sherman retired from the firm, the name was changed to Charles W. McKay & Associates. Recently the interests of the latter have been merged with those of the Roberts-Pettijohn-Wood Corporation and Mr. McKay received his present appointment.

Since his graduation from Sibley College of Mechanical Engineering, Cornell University, in 1906 he has been engaged in engineering and appraisal work with what is now the New York Telephone Company, the McCall & Clark Company, efficiency experts of New York City; McMeen & Miller of Chicago, where he spent the major portion of his time on problems involving the appraisement of public utility properties; Central Union Telephone Company, the Cooley & Marvin Company and with L. V. Estes, Inc., of Chicago.

Mr. McKay is valuation consultant for the Industrial Extension Institute and has contributed numerous articles to the technical press.

Metal, Coal and Material Prices

Metals—New York	July 17
Copper, electrolytic, cents per lb	14.687
Copper wire base, cents per lb	17.50
Lead, cents per lb	6.05
Zinc, cents per lb	6.47
Tin, Straits, cents per lb	37.875
Bituminous Coal, f.o.b. Mines	
Smokeless mine run, f.o.b. vessel, Hampton Roads, gross tons	$5.375
Somerset mine run, Boston, net tons	2.625
Pittsburgh mine run, Pittsburgh, net tons	1.95
Franklin, Ill., screenings, Chicago, net tons	1.675
Central, Ill., screenings, Chicago, net tons	1.55
Kansas screenings, Kansas City, net tons	2.625
Materials	
Rubber-covered wire, N. Y., No. 14, per 1,000 ft	$7.05
Weatherproof wire base, N. Y., cents per lb.	18.75
Cement, Chicago net prices, without bags	$2.20
Linseed oil (5-bbl. lots), N. Y., per gal	$1.05
White lead, in oil (100-lb. keg), N. Y., cents per lb	11.85
Turpentine, (bbl. lots), N.Y., per gal	$0.93

Rolling Stock

Jackson Railway & Light Company, Jackson, Tenn., has recently purchased three double-end Birney cars, Westinghouse equipment, from the American Car Company of St. Louis.

Dayton & Troy Electric Railway Dayton, Ohio, recently placed an order with the American Car & Foundry Company for ten box cars. The capacity of the cars will be 80,000 lb. Delivery is expected in September.

Louisville Railway has arranged to place orders with the Kuhlman Car Company, Cleveland, for forty pieces of additional equipment, which will include fifteen motorized cars and twenty-five trailers, total cost being around $350,000. Frank Miller, vice-president, stated that the motor cars would be equipped with 35-hp. General Electric 247-I motors and Westinghouse air brakes. Purchase of the additional equipment was recently approved by the board of directors, and company representatives have been conferring with the municipal utility authorities as to type. The cars will be of what is known as the "Peter Witt" type cars. The motor cars will have a two-door entrance at the front and another in the center. During dull hours they can be used as one-man cars. During rush hours they can be manned by two operatives. An order was recently placed by the company for ten motor cars and thirty trailers. This equipment was referred to in the ELECTRIC RAILWAY JOURNAL, issue of June 16.

Track and Roadway

Atlantic Shore Railway, Sanford, Me., will extend its line 2½ miles.

Durham Public Service Company, Durham, N. C., expects to reconstruct 2,000 ft. of track with 80-lb. T-rail and steel ties.

Capital Traction Company, Washington, D. C., plans to spend during the present summer and coming fall about $546,500. The biggest job will be the replacement of the track on Seventh Street, N. W., from Pennsylvania Avenue to the Seventh Street carhouse. This work will cost about $274,000.

Dallas Railway is now laying heavy channel steel on Beverly Drive as part of its improvement program in Highland Park. Mayor H. R. Davis said the improvements by the traction company are being made in return for the privilege of collecting an 8-cent fare recently granted by the city.

Southern Public Utilities Company, Charlotte, N. C., will begin work on Aug. 1 on the extension of the line from its present termination on Glade Street to the new high school building.

Los Angeles Railway has started construction of double track on West Seventh Street between Hoover and Vermont Avenues. Seven-inch, 116-lb. Trilby rail is being used. This involves construction of half a mile of double track and will provide a new route for Western Avenue cars. Track now used on Hoover, Wilshire and Commonwealth Boulevards will be removed.

Union Traction Company, Coffeyville, Kan., through its stockholders has ratified the proposal to extend the interurban line 22 miles farther south into Oklahoma, reaching the towns of Talala and Oolagah. The extension of the Coffeyville-Nowata line to Oolagah, Okla., would place it within 45 miles of Tulsa. When the line is built into Oolagah, it is expected that an extension will then be undertaken to Collinsville, the largest town between Tulsa and Nowata.

Power Houses, Shops and Buildings

Northern Texas Traction Company, Fort Worth, Tex., is building a $34,000 reinforced-concrete paint shop at Pacific Avenue and Pine Street.

Northern Indiana Power Company, Kokomo, Ind., has purchased two 750-hp. boilers with stokers and auxiliary equipment.

Union Traction Company, Anderson, Ind., expects to build a large terminal station in Anderson, and has filed deeds with the Madison County recorder for all the real estate in the first half block south of Fifth Street, between Main Street and Meridian Street. The property cost $35,000. It is said that work on the new building will be started next year.

Pacific Electric Railway, Los Angeles, Calif., in connection with its Alhambra-San Gabriel line extension, will install a new power substation to take care of the increased power demands, also to improve the power conditions on the Alhambra-San Gabriel and Pasadena, Sierra Madre and Glendora lines. The new terminus on the line extension will be located at Golden West and San Gabriel Avenue, where a joint freight and passenger station will be constructed.

Trade Notes

Boiler Equipment Service Company, Atlanta, is now selling diamond soot blowers in the states of Georgia and Florida, having been appointed district representative by the Diamond Power Specialty Corporation of Detroit.

A. S. Moody, assistant northwest manager of the General Electric Company, has been appointed local manager of the Los Angeles office of the same company, to succeed R. L. Cash, who has been transferred to Schenectady. Mr. Moody is well known in the electrical industry on the Pacific Coast, having been identified with the General Electric Company in that section for the past sixteen years.

Union Switch & Signal Company, Swissvale Pa., has the contract from the Long Island Railroad for installing a complete system of automatic signaling on the four-track electric line between Hillside and Floral Park. This includes two electro-pneumatic interlockings, one at Queens, comprising ten switches and fourteen signals, and one at Floral Park, comprising nineteen switches and nineteen signals, as well as the remodeling of an existing mechanical interlocking at Hollis and the installation of twenty-seven automatic block signals between the interlockings. The automatic signals will be Style "B" 110 volts, 25 cycle, located on signal bridges spanning the four tracks. As an emergency power supply feature, a frequency changer will be installed at each interlocking to convert the 110 volts, 60-cycle city supply to 110 volts, 25-cycle.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., received a contract from the Cleveland Railway for $400,000 of substation equipment. The apparatus in the order includes eight 1,500-kw., 514-r.p.m., six-phase, 60-cycle, 600-volt, d.c. converters, twenty-four 550-kva., single-phase, 60-cycle, 11,000-volt transformers and automatic switching equipment for the control of four two-unit, 3,000-kw. substations. Each substation consists of two 1,500-kw. converters and all are to be equipped with supervisory control apparatus so that they can be remotely controlled from the dispatcher's office. Each substation will be equipped with nine feeders of the short-circuit detector type. In addition to this apparatus the order also included seven 550 kva. transformers, six of which are to be used in place of air-blast transformers included in a previous order for four 3,000-kw., two-unit substations and the other to be used as a spare. The plan of the Cleveland Railway calls for the erection of nine automatic substations in various parts of the city and the dismantling of the company's generating plant. The project was referred to in the ELECTRIC RAILWAY JOURNAL, issue of May 19.

New Advertising Literature

Chausse Oil Burner Company, Detroit, Mich., has issued a new circular describing its railway torches.

Blacker Engineering Company, Grand Central Terminal, New York, has just issued a leaflet describing its Blacker "B" blacksmithing hammer for hand forging.

Okonite Company, Passaic, N. J., has published a booklet entitled "Splices and Tapes." The last page of this eight-page pamphlet gives instructions for making a perfect splice or joint.

Dossert & Company, New York, announce they have ready for distribution new price sheets covering all types and sizes of Dossert connectors. These sheets are Electrical Supply Jobbers' Association standard size.